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A MONTHLY JOURNAL DEVOTED TO THE PROBLEMS AND DISEASES OF INFANCY AND CHILDHOOD

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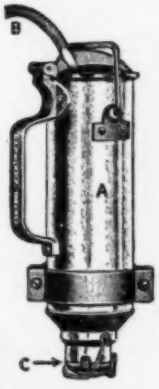

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The Journal of Pediatrics

VOL. IV JANUARY, 1934 No. 1

Original Communications

ON RICKETS

E. GORTER, M.D.
LEIDEN, HOLLAND

AMONG the diseases prevailing in my country, where the sunny days are few in number and the sun stands low during a great part of the year, rickets is one of the most important. This statement holds good at the present time although severe forms are much rarer nowadays than twenty-five years ago. (Fig. 1.)

By the cooperation of several authors in different countries, among which your country occupies a place of honor, it has been definitely settled that in rickets a disturbance of inorganic phosphate metabolism is found which results from a deficiency of ergosterol in its active form.

It is not necessary to go into detail about the series of remarkable researches that have led to this discovery. What I should like to discuss first of all is the quantitative side of the problem in human clinical observation. I shall try to find an answer to the following questions:

What is the minimum amount of vitamin D that can cure or prevent rickets in childhood?

What is the minimum amount of energy of ultraviolet light that can, by irradiating the skin, cure or prevent rickets in children?

It is obvious that one of the most important things that one should be familiar with before studying the last question is the wave length that is curative in rickets. This last assertion can easily be illustrated by the following comparison. Only the energy of those rays which are active in the transformation, or in other words are absorbed by the ergosterol in the skin, must be measured. If a lamp sends out a great amount of inactive rays, the measurement of the total energy of the lamp (in calories) would give no reliable insight into its activity in rickets. It is therefore necessary to know the wave lengths that are active and then to measure the energy of the active group only.

(From the Hospital for Sick Children at the University of Leiden.)

Address before the American Academy of Pediatrics, Chicago, June 12, 1933.

The following example will illustrate this:

If we wish to measure the phenomenon of bleaching of a color and to study the minimum energy necessary to produce this effect, it is obvious that we should not measure the energy of the whole spectrum of a lamp, but only of the wave length that produces the bleaching, or, in other

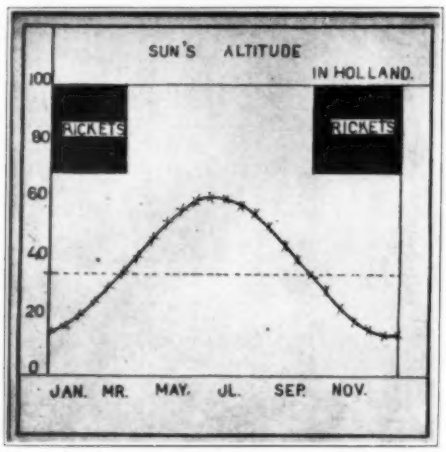

Fig. 1.—Altitude of sun in Holland by months.

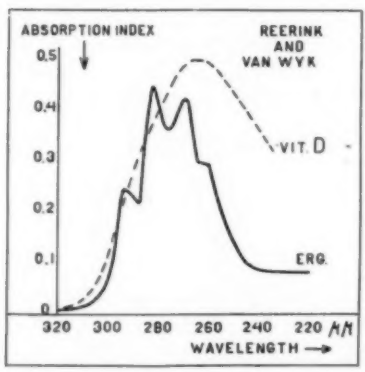

Fig. 2.—Absorption curve of ergosterol.

words, that is absorbed by the color. Just as in this example where the nonabsorbed light is inactive and should not be measured to know the energy of activity of a lamp in bleaching, so in determining the total energy of the light that is active in rickets we must take into account only that part of the spectrum that is curative, or in other words, that is absorbed by the ergosterol in the skin.

A great amount of work has already been done in determining the wave length that is active in curing rickets.

Hess and Anderson have studied monochromatic light. They found that the activity at 3130 Å is very feeble. This must be regarded as the upper limit of the antirachitic field. On the other hand, as the atmosphere does not allow the passage of sunlight having a shorter wave length than 2950 Å and because sunshine is capable of curing and preventing rickets, we may conclude that 2950-3100 Å is the range of active waves in the sunshine.

From the absorption curve of ergosterol (Reerink and Van Wijk) (Fig. 2) you will see that these wave lengths are absorbed so that they can be active. In addition, shorter wave lengths are strongly absorbed, and it is worth while to ask whether those wave lengths are in vivo equally active.

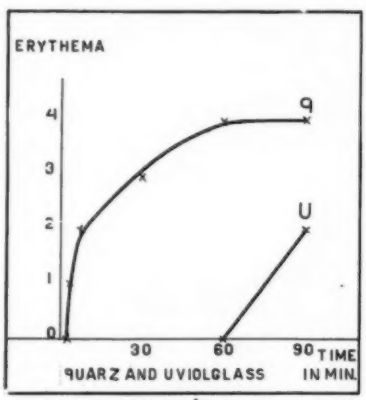

Fig. 3.

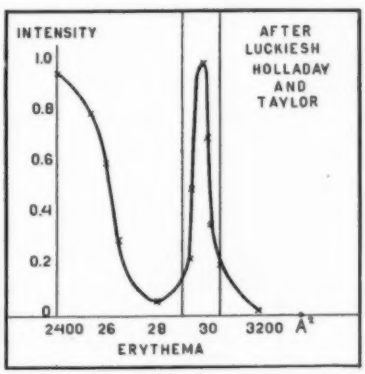

Fig. 4.

Fig. 3.—Erythema produced by quartz and uviol glass irradiation.
Fig. 4.—Wave length band (2950-3150 Å) producing erythema.

I have some reason to believe that they are not. Already in the transformation of vitamin D from ergosterol in the laboratory some observers prefer the use of long wave lengths, but this is an opinion not held by all authors.

To decide the quite different problem of the activity in skin irradiation, we have studied the effects of two mercury vapor lamps, one having an uviol glass bulb, so that the shorter wave lengths are considerably weakened; the other a quartz bulb, which permits the shorter wave lengths to pass in full strength. In measuring the energy of the longer wave lengths hardly any difference was found, whereas the shorter wave length was twenty times stronger in the quartz lamp. Corresponding with this differences, erythema was produced in a much shorter time by the quartz lamp (Fig. 3). Here the active wave lengths are 1°, a

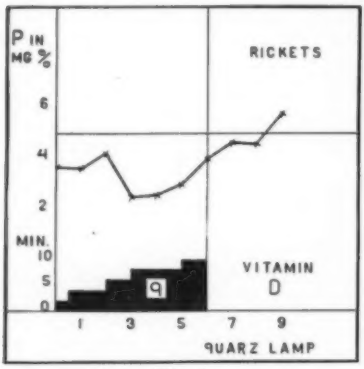

Fig. 5.

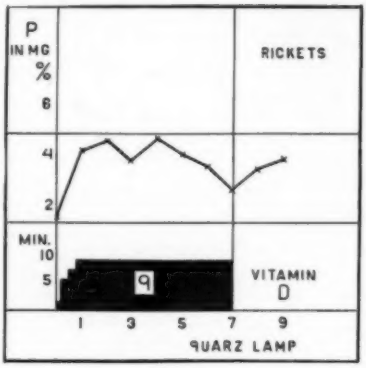

Fig. 6.

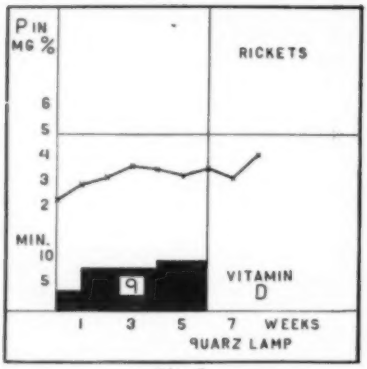

Fig. 7.

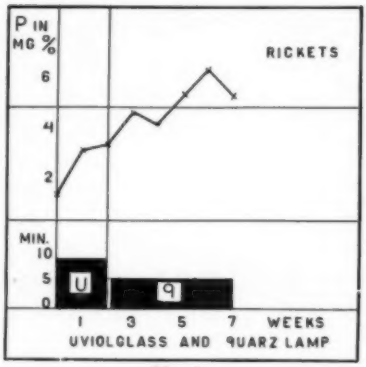

Fig. 8.

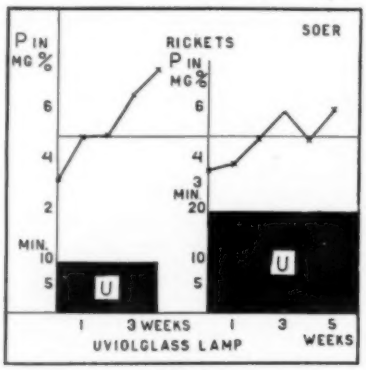

Fig. 9.

Figs. 5, 6, 7, 8, and 9.—Effect of quartz and uviol glass irradiation on rachitis.

long wave-length group, a narrow band between 2950-3150 Å, and 2°, a short wave-length group under 2650 Å. (Fig. 4.)

The first group was the same with both lamps, so that the difference in erythema response is due to the large amount of short wave length emitted by the quartz lamp.

We have studied the curative effect of these two lamps in rickets. It was necessary to limit the time of exposure to ten minutes, because of the erythema produced by more prolonged radiation. If the short wave length, principally the 2536 Å line, should have a very strong curative effect, the results with the quartz lamp should have been very much better than with the uviol glass lamp, as the erythema was produced by a much shorter exposure when the quartz lamp was used.

The results were, however, quite different: neither lamp, under the conditions described, was sufficiently active in all cases, and where there was a difference, the uviol glass lamp seemed the best. Some examples of these experiments are shown in Figs. 5, 6, 7, 8, and 9.

It is therefore possible to use the uviol glass lamp for determining the total energy in the wave lengths of 2967 Å and 3023 Å, the lines of this part of the spectrum in a mercury lamp, and to study the energy required to cure rickets.

I will not go into detail of the physical methods for measuring the intensity of the lamp. Suffice it to say that the very accurate method worked out by de Haas and Wierdsma, of the Leiden Physical Laboratory, has been applied by Seeder.

The minimum duration and surface of irradiation has been found to be: 2 square dM at a distance of 50 cM during ten minutes. From the energy emitted by the lamp used in these experiments it was calculated that daily 0.1 cal. of a wave length of 2970 Å is the dose required to cure rickets.

VITAMIN D REQUIREMENTS IN RACHITIS

What is the minimum amount of vitamin D that must be administered by mouth to rickety children to obtain a quick and satisfactory cure in a few weeks?

We have found that of an ergosterol preparation containing ± 10 per cent vitamin D, 0.02 mg. is usually insufficient, whereas 0.05 mg. is almost always effective in curing rickets. The results we have obtained may be deduced from Figs. 10 and 11. It seems probable that the amount necessary to prevent rickets is somewhat smaller than the dose for curative treatment.

I have calculated the size of the surface that could be covered by the amount of vitamin D sufficient to cure rickets when spread in a monolayer and found that it was ± 10 square cM.

I am not pretending that I have exactly determined the amount of vitamin D necessary to cure rickets. More than a rough estimation cannot be made in clinic observation, because experimental conditions cannot be fulfilled. There are existing differences in the intensity of the case of rickets submitted to treatment, as well as to the amount of vitamin D consumed or of sunshine received during the period preceding

DATA	P IN MG %	VIT. D MG	DATA	P IN MG %	VIT. D MG
9 A	3		24 A	3	
27 ··	4.2	0.02	30	4.3	
4 M	5.2	D	7 M	4.2	0.02
23 A	2.8		14	3.7	
30 ·	5.0	0.02	21	4.3	
4 M	5.4	M	30	6.2	B
25 A	4.1		13 M	2.5	
30 ··	5.4		22 ··	3.0	
7 M	5.8	0.02	28··	3.9	0.02
21 ·	6.0	v.R	4 J	4.1	
			11·	4.9	M B

Fig. 10.—Showing failure of 0.02 mg. of vitamin D in treatment of rachitis.

AFTER SOER		NO RICKETS	SLIGHT	DISTINCT
CONTROL GROUP	93	29	4	50
0.020 MG VIT. D	36	36	0	0
0.010 MG VIT. D	80	77	2	1
CODLIVER OIL	26	22	2	2
PROPHYLACTIC DOSE OF VITAMIN D				

Fig. 11.—Satisfactory results from 0.02 mg. of vitamin D in prophylaxis.

the visit to the policlinic. Moreover, it is impossible to assemble control groups, because treatment of a disease like rickets must be applied at the moment of its discovery.

The results of experiments in animals are therefore much more important. They show conclusively that in rats the minimum curative dose is in rather good agreement with what we find, if we calculate the quantity of vitamin D per gram weight.

In these studies we have made use of several quantitative methods applicable to the study of the intensity of rickets. As such, the phosphate determination is of great value, as well as the study by x-ray and the clinical examination.

All these data are, however, subject to criticism and have been severely criticized. Clinical examination in beginning rickets and also in rickets in older children does not always give clear results. We have to admit that in the first group it is not always possible to say whether or not rickets has already produced its ill effects on the bones. For instance, the importance of craniotabes as a sign of early rickets has been greatly lessened, and we all have seen cases of early rickets in which there was a fall of phosphate of the blood without a sign of rickets at the epiphyseal lines. In older children the difficulties are of the reverse type because signs of tumefaction and disordered structure at the epiphyseal border outlasts the existence of low blood phosphate. In animal experiments the most reliable data are considered to be the x-ray pictures, unless one is able to determine the total calcium (or ash) content of bones. This is an exceedingly nice method and it has been applied by several workers.

It would seem worth while to apply this method in clinical work. We have worked out this possibility by checking the shadow on the x-ray film with a wedge of ivory. This enables us to determine the total amount of x-ray-absorbing material in the bones compared to the soft parts and even its distribution in the several structures. We obtain in this way a picture of the calcium distribution in one curve.

THE USE OF AN IVORY WEDGE IN DETERMINING X-RAY-ABSORBING MATERIAL IN BONE

We take an x-ray picture of the wrist in the ordinary way and place on the plate a wedge of ivory. The wedge and a film are shown in Figs. 12 and 13. Now we have only to compare the intensity of the shadow on the plate at different points. To obtain this a rather complicated physical apparatus must be used, namely, a photometer. We were enabled, through the courtesy of Professor de Haas to use a Moll photometer. (Fig. 14.) Fig. 15 is a schematic drawing showing the principle of its use.

We place before the slit of the apparatus an exactly defined part of the photograph, 1° of the wedge. The instrument makes a line indicating the increasing absorption of light of the wedge; 2° of the soft parts near the bone and 3° of the bony part itself. We thus obtain a curve of the bony structure that is explained in Fig. 16 showing an enlarged photograph of the bone and the line described by the instrument. The actual curve is shown in Fig. 17. We have by chemical method determined the calcium content of the ivory wedge and can now express in milligrams of calcium each centimeter of height of the curve.

This conclusion is valid only if we assume that practically no other chemical component besides calcium absorbs the x-ray. This must be true, because no other element having the same or nearly the same

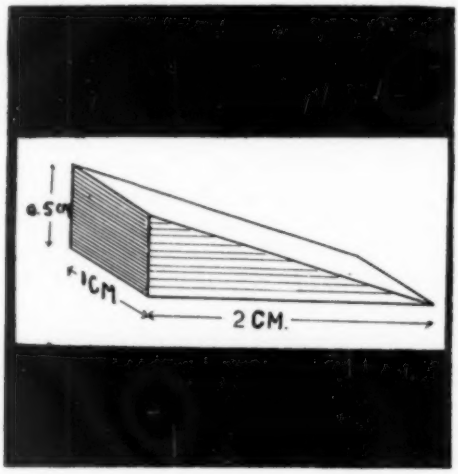

Fig. 12.—Ivory wedge.

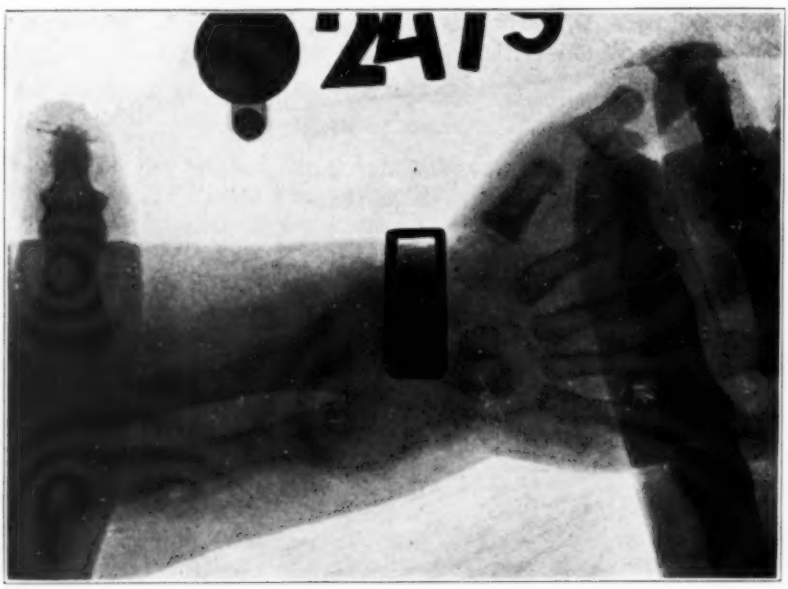

Fig. 13.—Film with wedge.

atomic weight is present in bone in nearly the same amount. Moreover, it has been proved directly by the observation of Weech and Smith of Baltimore that the decalcified bone absorbs no more x-rays than the soft parts.

It goes without saying that results are different if the thickness of bone is different. But this does not invalidate the practical applicability

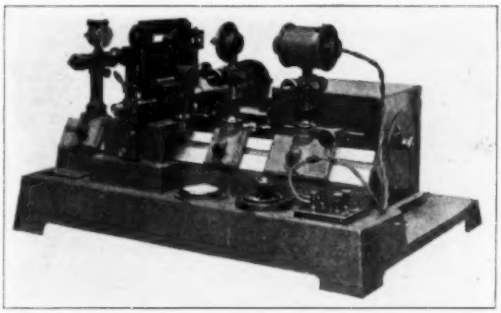

Fig. 14.—Moll photometer.

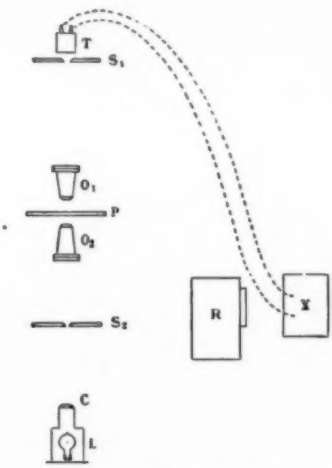

Fig. 15.—Schematic method of use.

of the method, because one can take account of this fact either by comparing the condition of the same bone, as in rickets, under influence of treatment, or by measuring the thickness of the bone and calculating the final result in square centimeters.

By this method we have already discovered the very remarkable fact that near the epiphyseal line a displacement of calcium takes place.

The calcium is diminishing near the diaphysical part and is increasing at the typical line zone. This can be illustrated (not actually proved) by a series of enlarged photographs taken at one-week intervals. Differences of developing, of exposure, and of hardness of the x-ray can disturb the observation: the wedge of ivory is indispensable in obtaining comparable results.

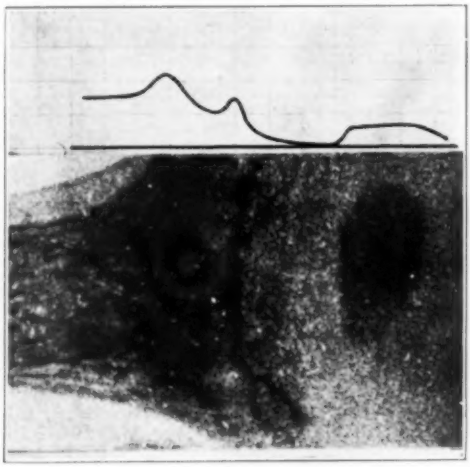

Fig. 16.—Enlarged picture of bone with line made by instrument.

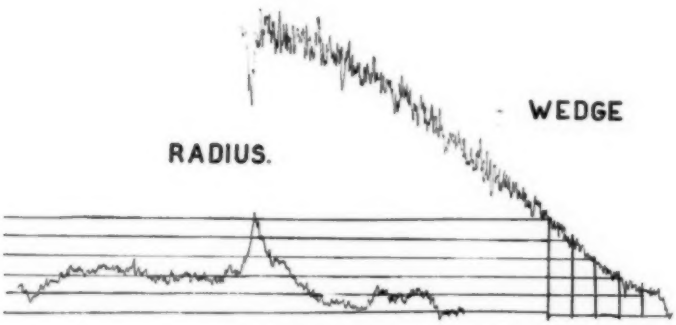

Fig. 17.—Tracing of actual curve.

As this method has only scientific value and is far too complicated for general application in practice, we have tried to simplify it. This has been possible by the following adaptation:

The intensity of the blackening of the x-ray photograph is compared, with the aid of the Zeiss Stufenfotometer, to that given by a series of platelets of ivory of increasing thickness. A surface of one-half square

centimeter is compared to the same surface of the blackening due to the ivory plate. It is therefore necessary to place a plate of ground glass between the film and the instrument, because we intend to measure the total amount of calcium and not the structure.

	P IN MG %	RAD E	RAD L	DIFF E - L	RIC-KETS
		IN MILLIMETER			
18 FB	2.3				
23 ..		2.29	2.27	0.02	
29 ..	5.0	2.26	2.18	0.08	1 MM. = 28 MG CA PER 59 CM
SMR	5.8				
10 ..		2.75	2.04	0.71	
15 ..	8.3	2.77	1.89	0.88	
20 ..	5.7				
25 ..		2.78	1.75	1.03	
30 ..	6.0	2.69	1.71	0.98	
DISPLACEMENT OF CALCIUM					
					ENDTZ

Fig. 18.—Showing displacement of calcium.
Rad E: ½ cm² at the epiphyseal calcium line zone.
Rad L: ½ cm² at more proximal part of bone.
E-L: Increase in calcium content of the epiphyseal line zone.
Numbers are in millimeters. Each millimeter corresponds to 28 mg. Ca per sq. cm.

By this method we were able to confirm the fact that the curing of rickets can coincide with displacement of calcium in the epiphyseal part of the bone.

HODGKIN'S DISEASE IN CHILDHOOD

A Clinical Study with a Résumé of the Literature to Date

Clement A. Smith, M.D.
Boston, Mass.

THE condition known as Hodgkin's disease, lymphogranuloma, lymphadenoma, and by many other names, is worthy of a clinical study with reference to the childhood period for two reasons. First, it may be possible to suggest principles of diagnosis, prognosis, and treatment particularly applicable to this age group. Second, the characteristics with regard to age, sex, and relation to other disease processes may be helpful in evaluating theories as to the etiology of the disease. The following review is based upon personal observations and records of 23 children under fourteen years of age seen in the Pediatric Clinic of the University Hospital in the past six years, and upon the childhood cases reported in the literature during the past thirty years. The diagnosis in the 23 cases reported below was verified by biopsy or autopsy performed in this hospital in 21, and by biopsy done in another hospital in 1 of the others. The remaining child, though clinically typical and later dying of the disease, had no biopsy or autopsy diagnosis. All but 2 of the 23 children have been traced, either to death or to their present status.

Two of Hodgkin's original 6 patients[1] were children. Of these, 1 seems to have been an example of generalized tuberculosis, but the other, a boy of ten years, showed typical manifestations of the entity now known by Hodgkin's name. Fox,[2] in 1926, examined some of the original material from this patient microscopically, and feels that the sections were characteristic of the disease. All authors, as Ziegler,[3] Bunting,[5] Desjardins and Ford,[6] Minot and Isaacs,[7] who have reviewed large groups of cases, show certain percentages as occurring in the first two decades of life, but in their articles there is no special study of the childhood group. Catherine Corbeille,[8] of the Mayo Clinic, reported in 1928 a summary of 33 cases in childhood, the largest single series. Six cases were reported from Brazil by Acuña and Casaubon[9] in 1926. W. Feer,[10] of Zurich, presented 9 cases in 1929; Nobécourt and his associates[11] reported 3 in 1930, and in 1931 Sighinolfi and Scarzella[12] gave detailed findings in 12. Besides these, some 20 scat-

Presented in part at the meeting of the University of Michigan Pediatric and Infectious Disease Society, November 12, 1932.

From the Department of Pediatrics and Infectious Diseases, University Hospital, Ann Arbor, Michigan.

TABLE I

SUMMARY OF CHILDHOOD CASES

CASE NO.	AUTHOR	SEX	AGE AT ONSET	DURATION OF DISEASE	LIVING OR DEAD	SITE OF ONSET	TUBERCULIN	REMARKS
1	Henderson[13]	F	6 yr.	1 yr.	L	Right cervical	None	Biopsy.
2	Peacocke[14]	M	3 yr.	1½ yr.	D	Right cervical	None	Biopsies not definitely positive.
3	Peacocke	M	4 yr.	6 mo.	L	Left cervical	None	Patients were twin brothers.
4	Codet-Boisse[15]	M	2 yr.	3½ yr.	L	Left cervical	None	No biopsy report.
5	Parkinson[16]	M	6 yr.	6 mo.	L	Left cervical	None	No biopsy report.
6	De Wolf[17]	M	2 yr.	2 yr.	L	Right cervical. Right axillary and others	Suggestive positive	No biopsy report.
7	Mac Lennan[18]	M	8 yr.	1 yr.	D	Abdominal	None	Postmortem positive for Hodgkin's. Had congenital syphilis.
8	Porter[19]	F	27 mo.	9 mo.	D	Abdominal	None	Autopsy.
9	Cautley[20]	F	8 yr.	6 mo.	D	Both cervical areas and others	Negative	Biopsy.
10	Levy[21]	M	18 mo.	3 wk.	D	Left cervical	Negative	Autopsy.
11	Herlitz and Wahlgren[22]	M	5½ mo.	12 mo.	D	Both cervical areas	Negative	Biopsies and autopsy.
12	Priesel and Winkelbauer[23]	F	3 mo.	6 wk.	D	Left skull Abdominal	Not done	Biopsy, postmortem; sarcomatous type; mother had Hodgkin's disease.
13	Gysi[24]	M	10 yr.	1 yr.	L	Both cervical areas and other nodes	None	Biopsy.
14	Cowie[25]	F	8 yr.	6 yr.	L	Both cervical areas	Negative	Biopsy. Patient now living after fifteen years.
15	Wollstein and MacLean[26]	F	4 mo.	6 wk.	D	Skin, thymus, thoracic and abdominal	Negative	Autopsy.
16	Catel[27]	M	2½ mo.	16 mo.	L	Left cervical	Negative	Biopsy.
17	Barberi[28]	M	6 yr.	2½ yr.	D	Left cervical	Negative	No biopsy.
18	De Capua[29]	M	6 yr.	9 mo.	D	Left cervical	Negative	Biopsy.
19	Pinelli[30]	M	2 mo.	6 mo.	L	Left cervical	Negative	Biopsy.

TABLE I—CONT'D

CASE NO.	AUTHOR	SEX	AGE AT ONSET	DURATION OF DISEASE	LIVING OR DEAD	SITE OF ONSET	TUBERCULIN	REMARKS
20	L'Esperance[36]	F	8 yr.	8 mo.	D	"Cervical"	Not stated	Biopsy and autopsy. Material produced avian tuberculosis in chicken.
21	Wiener[31]	M	10 yr.	6 wk.	D	Cervical and abdominal	Negative	Autopsy.
22	Nicolao and Povoa[32]	M	2 yr.	3 yr.	L	Left cervical	Negative	Biopsy.
23	Nobécourt, et al.[11]	M	5 yr.	2 yr.	D	Left cervical	Negative	Autopsy. Coexisting tuberculosis.
24	Nobécourt, et al.	M	5 yr.	3 yr.	D	Left cervical	Negative	Biopsy. Coexisting tuberculosis.
25	Nobécourt, et al.	F	9 yr.	1 yr.	L	Left cervical	Negative	Biopsy.
26	Feer[10]	F	3 yr.	5½ yr.	L	Right cervical	Negative	Biopsy. Well, 5½ years from onset.
27	Feer	M	5 yr.	1 yr.	D	Left cervical	Negative	Biopsy and autopsy.
28	Feer	M	8 yr.	2½ yr.	D	Left cervical	Negative	Biopsy.
29	Feer	F	14 yr.	6 mo.	D	Right cervical	Negative	Biopsy and autopsy.
30	Feer	M	13 yr.	10 mo.	D	Both cervical areas and thoracic	Negative	Autopsy.
31	Feer	M	7 yr.	5 yr.	D	Left cervical	Negative	Biopsy and autopsy.
32	Feer	M	3 yr.	4½ yr.	L	Left cervical	Negative	Biopsy. Still under treatment.
33	Feer	F	15 yr.	9 yr.	L	Left cervical	Positive	Biopsy. Still has involvement.
34	Feer	F	11 yr.	1½ yr.	D	Left cervical	Positive, becoming negative	Biopsy.
35	Acuna and Casaubon[9]	F	10 yr.	1 yr.	D	Left cervical	Negative	Autopsy.
36	Acuna and Casaubon	M	5 yr.	2 yr.	L	Left cervical	Not stated	No biopsy.
37	Acuna and Casaubon	M	10 yr.	1½ yr.	L	Cervical and axilla	Not stated	No biopsy.
38	Acuna and Casaubon	M	12 yr.	1½ yr.	L	"Cervical"	Not stated	Biopsy.
39	Acuna and Casaubon	M	13 yr.	6 mo.	L	Left cervical	Not stated	Biopsy.
40	Acuna and Casaubon	M	6 yr.	6 yr.	D	Axilla	Negative 3 months before death	Autopsy, showing tuberculosis and Hodgkin's disease. Died of tuberculous meningitis.
41	Sighinolfi and Scarzella[12]	M	6 yr.	4 yr.	D	Right cervical	Negative	Biopsy.
42	Sighinolfi and Scarzella	F	3½ yr.	8 yr.	D	Right cervical	Negative	Biopsy and autopsy.

TABLE I—CONT'D

CASE NO.	AUTHOR	SEX	AGE AT ONSET	DURATION OF DISEASE	LIVING OR DEAD	SITE OF ONSET	TUBERCULIN	REMARKS
43	Sighinolfi and Scarzella	M	5 yr.	10 mo.	L	Left cervical	Negative	No biopsy.
44	Sighinolfi and Scarzella	M	1½ yr.	3 yr.	D	Left cervical	Negative	Biopsy.
45	Sighinolfi and Scarzella	M	3 yr.	1 yr.	L	Left cervical	Negative	No biopsy.
46	Sighinolfi and Scarzella	M	2 yr.	6 mo.	D	Right cervical	Negative	No biopsy.
47	Sighinolfi and Scarzella	M	10 yr.	2 yr.	L	Both cervical areas	Positive	No biopsy.
48	Sighinolfi and Scarzella	M	6 yr.	3½ yr.	L	Both cervical areas	Negative becoming positive	No biopsy.
49	Sighinolfi and Scarzella	F	2½ yr.	10 mo.	L	Right cervical	Negative	No biopsy.
50	Sighinolfi and Scarzella	M	1½ yr.	2 yr.	L	Right cervical	Positive	Biopsy typical of Hodgkin's disease. No tubercle bacilli.
51	Sighinolfi and Scarzella	M	3 yr.	1½ yr.	D	Left axilla	Negative	Biopsy.
52	Sighinolfi and Scarzella	M	2 yr.	1½ yr.	D	Both cervical areas	Negative	No biopsy.
53-85	Corbeille[8]	30 M 3 F	2-14 yr.	1 alive at 5½ yr. 13 dead or moribund. Not all traced.		11, right cervical 14, left cervical	Negative, 18 Doubtful, 3 Positive, 0	Biopsy or autopsy in 20 cases.
86	Author's 1	M	1½ yr.	3½ yr.	D	Left cervical	Negative	Biopsy, Hodgkin's with myeloid transformation.
87	Author's 2	M	9 yr.	2½ yr.		Right cervical	Negative	Biopsy. Advanced Hodgkin's disease. Case not traced.
88	Author's 3	M	5 yr.	3½ yr.	D	Right cervical	Negative	Biopsy. Hodgkin's disease. No tubercles.
89	Author's 4	F	10 yr.	9 yr.	D	Right cervical	Positive becoming negative	Two biopsies. Hodgkin's disease becoming sarcomatous. Autopsy tuberculosis coexistant with Hodgkin's disease.
90	Author's 5	M	2 yr.	9 yr.	D	Both cervical areas	Negative	Two biopsies. Hodgkin's disease becoming sarcomatous.
91	Author's 6	M	6 yr.	12½ yr.	L	Left cervical	Negative	Biopsy. Sarcomatous Hodgkin's disease. Well after 12½ years.

TABLE I—CONT'D

CASE NO.	AUTHOR	SEX	AGE AT ONSET	DURATION OF DISEASE	LIVING OR DEAD	SITE OF ONSET	TUBERCULIN	REMARKS
92	Author's 7	M	4½ yr.	1 yr.	D	Cervical and abdominal	Not recorded	Autopsy. Hodgkin's disease with myeloid transformation.
93	Author's 8	M	5 yr.	9 yr.	D	Cervical and axilla	Not done	No biopsy. Sibling died of Hodgkin's disease.
94	Author's 9	M	9 yr.	3 yr.	D	Left cervical	Negative	Biopsy. Early sarcomatous Hodgkin's disease.
95	Author's 10	M	11 yr.	4 yr.	D	Right cervical	Negative	Biopsy. Sarcomatous Hodgkin's disease.
96	Author's 11	F	7 yr.	2 yr.	D	Left cervical	Negative	Biopsy. Advanced sarcomatous Hodgkin's disease.
97	Author's 12	M	12 yr.	2 yr.	D	? Mediastinal	Negative	Biopsy. Advanced Hodgkin's disease.
98	Author's 13	M	4 yr.	4 yr.	D	Left cervical	Negative	Biopsy. Advanced Hodgkin's disease.
99	Author's 14	M	4 yr.	8 mo.	D	Both cervical areas	Negative	Biopsy at another hospital.
100	Author's 15	M	19 mo.	5 mo.	D	Right temporal bone	Negative	Two biopsies; autopsy. Atypical sarcomatous Hodgkin's disease.
101	Author's 16	M	8½ yr.	3 yr.	D	Right cervical	Negative	Biopsy and autopsy. Hodgkin's disease.
102	Author's 17	M	12 yr.	6 mo.	D	Both cervical areas	Positive	Biopsy. Probable Hodgkin's disease.
103	Author's 18	M	7 yr.	3 yr.	L	Left cervical	Questionable	Two biopsies. Both Hodgkin's disease.
104	Author's 19	M	7½ yr.	4 mo.	D	Cervical	Negative	Biopsy. Hodgkin's disease.
105	Author's 20	M	7½ yr.	3 yr.	L	Left cervical	Negative becoming positive	Biopsy. Advanced Hodgkin's disease.
106	Author's 21	M	10 yr.	10 mo.	L	Left cervical	Questionable	Biopsy. Hodgkin's disease.
107	Author's 22	M	12 yr.	1 yr.		Left cervical	Negative	Biopsy. Hodgkin's disease "well established." Case not traced.
108	Author's 23	M	7 yr.	2½ yr.	L	Left cervical	Negative	Biopsy. Hodgkin's disease.

tering case reports have been found in the literature since 1900, before which time it is difficult to determine whether reported cases actually come within the definite classification of Hodgkin's disease. We have thus collected 85 cases from the literature, which, with our own cases give a total of 108. (Table I.)

SEX AND AGE

It is a recognized fact that the disease is about twice as common in the male sex as in the female. Ziegler[3] states that under the age of ten years, the frequency was more equal between the sexes. In the age group between one and ten years, he had 20 male and 15 female cases, while from eleven to twenty years, the figures were 25 and 10. Our experience shows a more marked predominance in male children, only 2 of our 23 cases having been girls. This proportion is almost as striking as Corbeille's group,[8] in which there were 30 boys and 3 girls. A summary of the sex distribution in our own cases plus those from the literature (Table I), gives a total of 88 male and 20 female children, or 81.5 and 18.5 per cent respectively. Of 113 cases over fourteen years of age diagnosed as Hodgkin's disease in the University Hospital during the past six years, the percentages were 65.5 and 34.5 for males and females. It would appear from these figures that the female is attacked later in life than the male, and in the childhood period less than one-fifth as frequently.

Ziegler[4] thought that the disease might be related to repeated infection of some sort, and that it perhaps attacked more males than females because the males were, by occupation, more frequently exposed to infectious agents. This theory, as Feer[10] has pointed out, is weakened by the still more marked predilection for males in the younger age group, in which one would hardly expect the environment of one sex to differ very greatly from that of the other. On the other hand, it is difficult not to feel that the matter of sex points to the same type of etiology for Hodgkin's disease as for leucemia and lymphosarcoma. Of 19 children with lymphatic leucemia seen in this clinic in the past six years, 15 were boys; while of 11 children diagnosed as lymphosarcoma, there was only 1 girl.

Hodgkin's disease, while commonly considered a disease of the younger decades of adult life, is not at all rare in childhood. Of Ziegler's total of 220 cases,[3] 16.4 per cent were in children under ten years of age, and 16.8 per cent occurred in the second decade. A comparison of our 23 children with the total group of 138 patients of all ages with the disease, seen in the University Hospital during this period reveals that 16.6 per cent of the total number were children. During the same period, 79.1 per cent of patients seen in the hospital were adults, and 20.9 per cent were children. The age of onset is always difficult to determine with certainty because of the unusually

insidious development of the disease. In general, no one period of childhood seems to be affected much more than another, though a division of our patients into three age groups shows more cases beginning in the midchildhood period. (See Table II.)

TABLE II

AGE AT ONSET

	BIRTH TO 4 YEARS	5 TO 9 YEARS	10 TO 14 YEARS
Number of cases	6	11	6

The onset occurred during the second year in 2 of our patients (Cases 1 and 15), and in none during the first year. Cases of the disease beginning in early infancy have been reported. Thus Pinelli[30] describes Hodgkin's disease beginning at two months, Catel[27] at two and one-half months, Wollstein and McLean[26] at four months, Herlitz and Wahlgren[22] at five months. Priesel and Winkelbauer[23] report the onset of the disease in a female infant before the third month. The mother died of Hodgkin's disease one week after the confinement. The authors believe this was an instance of placental transmission to the infant. Most of these cases in very early life are of only a few weeks' or months' duration, though the child reported by Catel was living sixteen months after the onset of symptoms.

RELATION TO OTHER INFECTIONS AND TO FAMILIAL DISEASE

There are no constant findings in the literature relating Hodgkin's disease to preceding infections and possible foci of infection, though because of the common onset in the cervical glands, some observers have suspected that conditions in the mouth and throat play some etiologic rôle. It would be difficult to associate Hodgkin's disease in young infants with such a possibility. Feer[10] found no constant evidences of predisposing infection or of foci in his cases. Corbeille,[8] in her 33 patients, found a definite history of infection at the onset of the disease in 12. Of these, cold and cough, with fever, occurred in 4, infected teeth and gingivitis in 2, and in 1 case each there was influenza, German measles, varicella, scarlet fever, mumps, and jaundice with cold, fever, and delirium. In our own cases the list is equally variable. In 16 there was no known disease condition immediately preceding the onset, of the remaining 7, otitis media occurred in 3 and there was 1 case each with furuncle of the neck, mumps, pertussis and varicella, and trauma to the head.

An analysis of the condition of the mouth and throat when our cases were first seen at the hospital (in many cases months or years after the onset of the disease), shows septic tonsils in 4, carious teeth in 7, a combination of these conditions in 4, and a normal condition in the remaining 8.

There are instances in the literature of more than 1 case of Hodgkin's disease in the same family. Thus Peacocke,[14] in 1905, reported an instance of what was apparently Hodgkin's disease in twin boys. Arkin[33] has reported a family in which a father, his brother's son, and his own son all died of mediastinal tumor. There were postmortem findings of Hodgkin's disease in one of these cases, while the disease was not diagnosed by this means in the others. The case of Priesel and Winkelbauer[23] in mother and daughter has been mentioned. A girl of twenty-one years, with verified Hodgkin's disease, has recently been seen in the Medical Clinic of the University Hospital, whose sister and cousin have died of the same disease. In one of our own cases (Case 8) a brother died at nine years of what was diagnosed by biopsy elsewhere as Hodgkin's disease. Another patient (Case 18) is one of identical twins. While this boy was undergoing treatment, the parents noted some enlargement of the cervical nodes in his twin brother. One of these nodes was biopsied but showed only a simple hyperplastic process, and the child has been well since.

RELATION TO TUBERCULOSIS

The relation between Hodgkin's disease and tuberculosis has been the subject of considerable study. For reviews of the subject the reader is referred to the papers of Simonds,[34] and of Lemon.[35] It has been approached from various angles: family history, clinical observation, tuberculin testing, histopathology, and animal inoculation. Recently, the work of L'Esperance,[36, 37] who has produced avian tuberculosis by inoculation of chickens with material from Hodgkin's glands has turned fresh attention toward the possibility of such a connection.

Ewing[38] has stated that tuberculous stigmata, tuberculous family history, or tuberculous lesions in the body are the rule in his New York cases. He mentions a patient in whom miliary tuberculosis, diffuse lymphocytosis, and typical Hodgkin's granuloma were found respectively in three small adjoining bronchial nodes. Ziegler,[3] although stating that in about 20 per cent of the cases of Hodgkin's disease tuberculosis was present elsewhere in the body, found no significant family history of tuberculosis in 45 of 54 cases which he investigated. Lemon[35] found *clinical* evidence of tuberculosis in only 8 of 191 cases studied. Parker and his associates[39] have presented a study of pathologic rather than clinical material, and have found a significantly greater percentage of tuberculosis, both healed and active (33.3 per cent), in Hodgkin's disease than in other types of lymphoma (5.3 per cent), or in cancer (14.6 per cent), or in general autopsies (19.3 per cent). The percentage of active tuberculosis in Hodgkin's disease (20) was very markedly greater than in their cases of other types of lymphoma (0), or in pernicious anemia (0), cancer (5.7), or in general autopsies (11). Thus, in their experience other forms of malig-

nant lymphoma than Hodgkin's disease were never associated with active tuberculosis, while the association in Hodgkin's disease was surprisingly frequent.

It would seem that some helpful evidence could be drawn from examining the family histories, clinical and pathologic findings, and skin reactions in a group of children with Hodgkin's disease. In this younger age period it should be easier to discover familial contacts, and to draw conclusions from tuberculin tests.

In our 23 cases there were only 2 instances of contact with tuberculosis. In one of these (Case 3) the child's mother had had tuberculosis at the age of fourteen, though for over ten years before the onset of Hodgkin's disease in the child she had remained apparently well. The child's tuberculin test was negative, and there were no clinical findings suggesting tuberculosis. He died at home, and no autopsy was obtained.

In the other child (Case 4), there was a strong familial contact with tuberculosis. She had fairly typical Hodgkin's disease, beginning at the age of ten years. A cervical gland showed on biopsy a picture reported as most probably early Hodgkin's disease, with no tubercles. She was seen several times in the clinic, and there were no evidences of tuberculosis until four years after the onset of her glandular swellings. Then she developed a parenchymal pulmonary lesion, and later tubercle bacilli in the sputum. A second biopsy was positive for sarcomatous Hodgkin's disease. Four years later, or eight years after the onset of Hodgkin's disease, she died with evidences of tuberculous meningitis. Autopsy showed tuberculosis of the lungs, the alimentary tract, and the meninges, with Hodgkin's disease of the bronchial and mediastinal nodes and lungs. It is unfortunate that tuberculin tests were not reported until two months before death, when there was a positive reaction to 0.01 mg. of tuberculin. The reaction shortly before death became negative to as much as 1.0 mg. of tuberculin. The case illustrates coexistence of undoubted Hodgkin's disease and tuberculosis over a period of four years as separate entities in the same patient.

Clinical and x-ray examination of the remaining patients have shown suggestions of tuberculosis in 5 of them, as follows: In Case 17, a boy with a repeatedly positive tuberculin test, a chest x-ray showed infiltration of the hilum on both sides, with prominence of the peritruncal shadows to the left apex. No focal parenchymal lesion was seen. This patient ran a rapid course, and died at home six months after the onset of his illness. No autopsy could be obtained. In Case 19, a boy of eight, with a negative tuberculin test, there was a marked infiltration of the right hilum, suggesting a hilus pneumonia, without mediastinal widening. This boy ran an extremely rapid course, and died at home after a four months' illness. Again there was no autopsy. In Case 20, a boy of nine, the first chest x-ray showed slight hilar infiltra-

tion, but no mediastinal widening. The tuberculin test was at this time negative; a year later there was x-ray evidence of mediastinal widening, though no other change in the chest, and the reaction to human tuberculin became positive four months thereafter. The child is under treatment at present. A fourth case, seen only in the Out-Patient Department (Case 22, a boy of thirteen), showed by x-ray scattered subpleural and hilum shadows suggesting old subpleural and hilus tuberculosis. The tuberculin reaction was negative. We were unable to follow this patient. Finally, Case 23, a boy of nine, had repeatedly negative tuberculin tests, but a moderate accentuation of the bronchovascular trunks without gross adenopathy. He is under treatment at present. In all of these cases biopsies of peripheral nodes demonstrated the histopathology of Hodgkin's disease without evidences of tuberculosis.

Special attention has been devoted by many authors to the rarity of positive tuberculin tests in Hodgkin's disease. Bastai[40] suggested that the extreme frequency of negative tuberculin reactions during this condition might be explained by a tuberculin anergy produced by the disease. He found that occasionally following irradiation negative reactors gave a positive reaction. Nobécourt and his associates,[11] reporting 3 cases of lymphogranuloma in children, 2 of whom had also definite tuberculosis, found negative response to tuberculin in all. They stress not only the probability of anergy but also the possibility that this may

TABLE III

TUBERCULIN TESTS IN HODGKIN'S DISEASE

SOURCE	NO. OF CASES	NEGATIVE	POSITIVE	QUESTIONABLE	POSITIVE BECOMING NEGATIVE	NEGATIVE BECOMING POSITIVE
Literature	59	50 (84.7%)	3 (5.1%)	4 (6.8%)	1 (1.7%)	1 (1.7%)
Author's cases	21	17 (80.9%)	2 (9.5%)	1 (4.8%)	0 (0%)	1 (4.8%)
Total	80	67 (83.75%)	5 (6.25%)	5 (6.25%)	1 (1.25%)	2 (2.5%)

be one reason why tuberculosis is so often found and spreads so rapidly in the patient with Hodgkin's disease. Parker, Jackson, Fitz Hugh, and Spies,[41] in testing the response of patients of all ages to avian and human tuberculin, have shown a distinctly lower percentage of positive reactors to tuberculin in Hodgkin's disease (21.4 per cent), than in a group of comparable normals (53.0 per cent). The percentage was also low in other diseases of the lymphoid and myeloid tissues, such as malignant lymphoma (26.6 per cent), leucemia (16.6 per cent), pernicious anemia (20.0 per cent), as well as in general malignancies (9.5 per cent). There was a lack of specificity of reaction to human and avian tuberculins. L'Esperance's reactions with avian and human tuberculin in cases of Hodgkin's disease[37] were also not very specific, though there was a tendency to more positive and more marked reactions with the former.

A review of reported cases in children shows 59 in which the tuberculin test (human type) is reported. These and our own findings are summarized in Table III.

Our own 2 patients listed as tuberculin positive are Cases 4 and 17. The former died of a proved combination of tuberculosis and Hodgkin's disease, and has been previously mentioned. Her last tuberculin test was negative, but this was two days before her death from tuberculous meningitis. Her positive reaction was after some years of irradiation, and it is possible that she, like Bastai's cases, might have had a negative tuberculin test before treatment. The other case had some x-ray evidences suggesting tuberculosis, as mentioned above. Case 20 was the only one on whom we have a record of a negative reaction becoming positive. The change occurred after sixteen months of irradiation.

Through the courtesy of Dr. L'Esperance we have been able to test the reactions of 5 of our patients with her avian tuberculin. In Case 6 the reaction to 0.1 mg. of avian and human tuberculins freshly prepared was negative. In Case 18 there was no response to 1.0 mg. of either type. In Case 20 the reactions with this strength were positive for human, and negative for avian tuberculin. In Case 21, 0.1 mg. of avian tuberculin gave negative results, while the same strength of human tuberculin gave a faint, questionable reaction. Reactions in Case 23 with 0.1 and 1 mg. were negative for both types. Thus, none of our avian tests have been positive. Dr. L'Esperance has written us that she is not very enthusiastic about the specificity of these tuberculin reactions in her patients. Parker and his associates,[41] as well as the extensive work of Mariette and Fenger[42] have also recently shown the non-specificity of these tests.

In general, our cases and our review of cases in children confirm the opinion that the tuberculin test is rarely positive in Hodgkin's disease. Whether in childhood this may be due to actual infrequency of co-existence between the two diseases is doubtful, as tuberculosis has been found at autopsy in 4 of a total of 20 collected autopsies in children with definite Hodgkin's disease. (Table I.) This would indicate a fair degree of frequency of association.

The following conclusions seem warranted:

A positive tuberculin test is decidedly rare in children with Hodgkin's disease, as is the experience in adults.

Postmortem evidence of tuberculosis is fairly common in childhood as well as in adult cases of Hodgkin's disease.

Hodgkin's disease may predispose to tuberculosis, and probably causes tuberculin anergy.

Reliable proof as to an etiologic relationship between avian and other special forms of tuberculosis and Hodgkin's disease must rest upon bacteriologic and inoculation evidence, rather than upon tuberculin tests.

The very unequal sex distribution of Hodgkin's disease in children as

well as in adults would seem to ally the disease etiologically with the general group of leucemias and lymphosarcomas, rather than with tuberculosis or other granuloma. At present there is no known infection of lymphoid tissue having so striking a predilection for one sex.

PATHOLOGIC FINDINGS

It is not within the scope of this report to describe in detail the pathology of Hodgkin's disease, nor is it necessary in view of the many descriptions in the literature. The term "sarcomatous Hodgkin's disease" is used by the Pathological Laboratory of the University Hospital to describe a certain rather definite form of the process, and this diagnosis was made in several of our cases. The form thus designated is described by Warthin[43] as follows: "By sarcomatous Hodgkin's we mean very actively growing, diffusely cellular, rather than nodular lesions, with few or no eosinophiles, or Dorothy Reed cells, and a greater tendency to infiltrate and to metastasize, particularly in the kidneys and lungs. The sarcomatous transformation of a Hodgkin's may proceed in one of two directions, either leading to a lymphosarcoma, or to a large-celled form, with abundant reticulum and numerous giant cells, which we have styled a reticuloeytoma or reticuloendothelioma. . . . This form shows a greater degree of malignancy than either the type Hodgkin's or the lymphoblastoma." This large-cell type is sometimes spoken of as the myeloid transformation of a Hodgkin's disease.

Ewing[38] describes much the same histologic picture, particularly similar to Warthin's second type of sarcomatous transformation. He

TABLE IV

RELATIONS OF TYPICAL AND SARCOMATOUS PROCESSES

	AVE. AGE AT ONSET	AVE. SURVIVAL (CASES KNOWN TO BE DEAD)
Typical	(12 cases) 8.0 yr.	(6 cases) 2.25 yr.
Sarcomatous	(7 cases) 5.7 yr.	(6 cases) 2.3 yr.

believes that a true lymphosarcoma composed of neoplastic lymphocytes has not been shown to develop in Hodgkin's disease. He suggests that Hodgkin's sarcoma is analogous to the epithelioma arising upon lupus or syphilis. Weber[44] has also considered the matter of Hodgkin's sarcoma, and believes that a number of cases with infiltration of the dura, periosteum, and bones are due to such a process.

Biopsy or autopsy examinations, or both, were made in this hospital on a total of 21 of our 23 patients. Of this group, the diagnosis of the usual form of Hodgkin's disease was made in 12 cases, of sarcomatous Hodgkin's disease in 7 cases, while in the remaining 2 children, repeated biopsies showed a change from a typical to a sarcomatous process. In general, the sarcomatous form tended to appear in somewhat younger children, but there seemed to be no important difference in duration for

the two groups. A tabulation of findings, omitting the 2 cases in which sarcomatous pathology developed in known typical Hodgkin's, is given in Table IV.

The longest known survival among our cases, a boy now living over twelve years after the onset of symptoms (Case 6), is in the sarcomatous

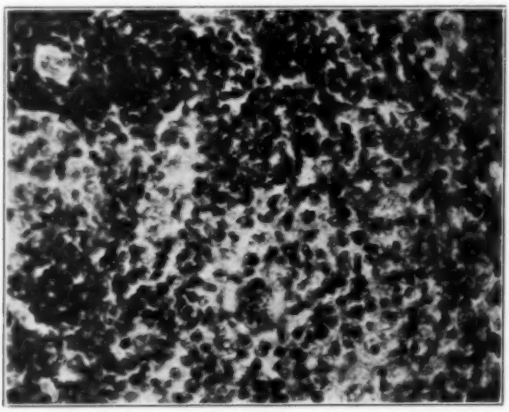

Fig. 1.—Case 22. Typical Hodgkin's disease, with more normal lymph node structure above. Many eosinophiles and lymphoblasts, and several large myeloid cells; one giant cell of Dorothy Reed type just below center. Fibroblastic proliferation (×500).

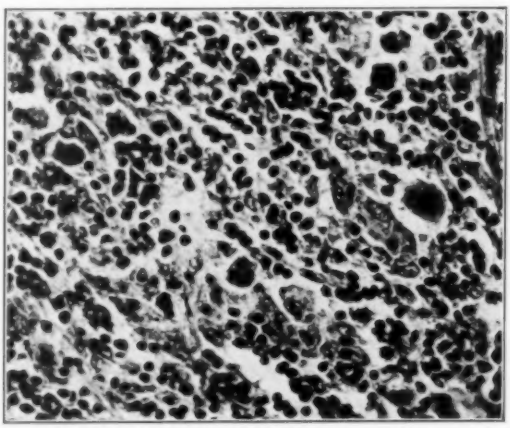

Fig. 2.—Case 11. Sarcomatous Hodgkin's disease. Few eosinophiles, numerous lymphoid cells, and prominent giant cells of Dorothy Reed type; marked fibroblastic proliferation (×500).

group. While our cases show a tendency for the sarcomatous form to appear a year or more after an earlier biopsy has shown typical Hodgkin's tissue, they do not give evidence that irradiation has been instrumental in producing this change, or that it hastens such a change in instances such as Cases 4 and 5, where it was seen to occur.

Four examples of our pathologic material have been selected for especial mention (Fig. 1, 2, 3, and 4). The first is from a biopsy in Case 22, a thirteen-year-old boy, whose onset occurred one year before the gland was removed. The case is selected from several as showing a

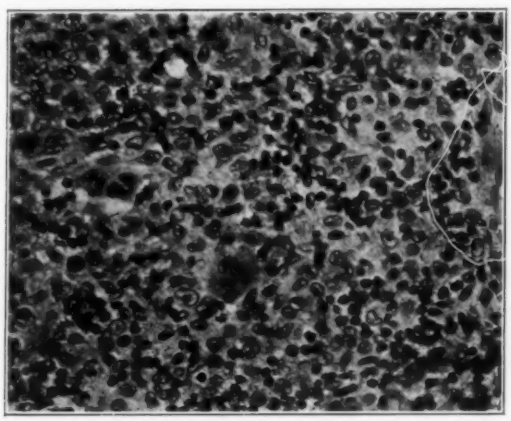

Fig. 3.—Case 15, biopsy. Sarcomatous Hodgkin's disease of primitive type. Predominance of cells of reticuloendothelium group, with some giant cells. Moderate number of lymphoid cells (×500).

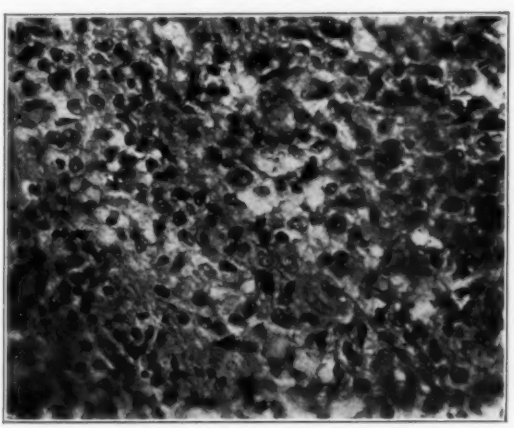

Fig. 4.—Case 15. Lymph node removed at autopsy. Predominance of more primitive cells of reticuloendothelial type; fewer lymphoid and giant cells (×500).

good example of the typical pathology of Hodgkin's disease. The second is from Case 11, a girl of seven years, the gland having been removed from her neck one year after the onset of swelling. This tissue is selected as exemplifying the characteristics of the sarcomatous form. The third and fourth sections are, respectively, from the first biopsy and

the autopsy in Case 15, a rapidly progressing process in a male infant of less than two years, who died four and one-half months after onset.

The first section shows the invasion of normal lymph node structure by the atypical lymphocytes, eosinophiles, myeloid cells, and the fibroblastic proliferation of the usual Hodgkin's disease.

The second shows histopathology described by Dr. Weller as follows: "While this lymph node shows the eosinophiles and fibroblastic proliferation of Hodgkin's disease, it differs from the usual type in its great cellularity. The cellular elements have increased at the expense of the stroma. While many of these cells are lymphocytes, there are many large mononuclear cells, and especially prominent are the mononuclear giant cells of bone-marrow type. In this latter respect, this resembles the so-called 'myeloid transformation' of a Hodgkin's disease, but in this instance the richness in cells is especially due to the large number of lymphocytes."

The sections from the third case, and the general autopsy diagnosis, were summarized by Dr. Weller as follows: "The neoplastic tissue is characterized by the presence of large spherical and polymorphous cells, having abundant, pale pink staining cytoplasm, and spherical nuclei showing an open, light staining arrangement of chromatin. Particularly in the lymph nodes, these cells fill the sinuses, and here bear a close resemblance to cells of the reticuloendothelium. Among them occasional mononuclear giant cells and cells with indented or lobed nuclei occur. While the biopsy material from the cervical lymph nodes showed numerous eosinophiles, such are largely absent from the deep nodes removed at autopsy. This therefore represents a form of Hodgkin's disease in the clinical sense, characterized by the overgrowth of a very primitive, undifferentiated cell resembling reticuloendothelium. It may be diagnosed a reticulocyto-blastoma. 'Sarcomatous Hodgkin's disease' with neoplastic transformation of all lymphoid tissue (all lymph nodes, peribronchial lymphoid tissue, spleen, alimentary tract, and liver) and neoplastic infiltration of the periosteum and substance of the temporal, sphenoidal, and zygomatic bones."

We believe these 3 cases illustrate important variations in pathology, all closely related and having some bearing on the essential nature of Hodgkin's disease. The first shows the usual picture. In the second there has apparently been an alteration in the cell structure of what is still essentially similar to the first. In the third, the rapid course of the disease and the youth of the patient suggest that the tissue found at autopsy is in general that of the original process, first evident a few months before. It is difficult to believe that here, in an infant of less than two years, a granulomatous tissue has altered its course to that of a neoplasm. It seems more reasonable to assume from these childhood cases that the so-called sarcomatous transformation of a Hodgkin's disease is actually only the overgrowth of a cell type originally present,

and that the original tissue is malignant whatever may become the dominant element. Rapidly progressive cases in infants, such as several found in the literature and our own case previously mentioned, deserve special attention. They may give evidence not only of the general nature of Hodgkin's disease, but also of the specific cell types from which the process is derived.

SYMPTOMS AND SITE OF ONSET—TISSUES INVOLVED

In most of our patients symptoms of onset were absent, the usual history being the discovery of a slowly enlarging gland. This was the case in 17, or more than two-thirds of the patients. Of the remaining 5 there were such symptoms as loss of appetite, weight, and strength in 3. These were apparently the more fulminating type of disease, as 2 of them (Cases 17 and 19) died within six and four months of onset, respectively; and the other (Case 22) could not be traced. In one child who had early mediastinal involvement (Case 12) an early symptom was persistent cough. In another "nervousness" was mentioned, and in the sixth there was some tenderness of the cervical swelling.

One patient, whose earlier cervical onset was so slight that its importance was not realized during his hospital course, was admitted with symptoms of severe illness, weakness, and extreme obstructive jaundice. This patient (Case 7) had an irregular fever of 102° to 104° F., and was diagnosed during the nine days he was in the hospital as probable sepsis, the correct diagnosis being established only by autopsy. The postmortem examination showed pronounced involvement of the abdominal and mediastinal glands, with pressure of an involved node on the common duct.

TABLE V

SITE OF ONSET

		CERVICAL			AXILLARY	ABDOMINAL OR MEDIASTINAL	BONES OF SKULL
		LEFT	RIGHT	BOTH			
Cases from literature	(77)	38	21	12	2	3	1
Author's cases	(23)	10	5	6	0	1	1
Total	(100)	48	26	18	2	4	2

Warthin,[43] discussing the Hodgkin's disease cases of all ages seen in the University Hospital, mentioned the frequency of early involvement of the left cervical glands. Feer[10] and others also noted this fact, and our cases in childhood substantiate these observations. A tabulation of the first known sites of onset in our cases, and in all childhood cases collected from the literature, shows that the cervical glands are much the most frequent site, and that the left side of the neck is more commonly involved early than the right. (Table V.)

Feer has offered an explanation for the frequency of left cervical involvement. He believes that it must be due to a truly primary involve-

ment of retroperitoneal and mesenteric glands, or of other abdominal structures. By lymphatic extension such processes would first show

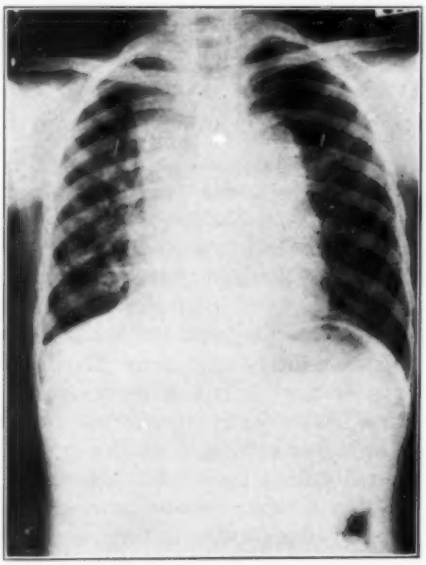

Fig. 5.—Case 12. Mediastinal Hodgkin's disease.

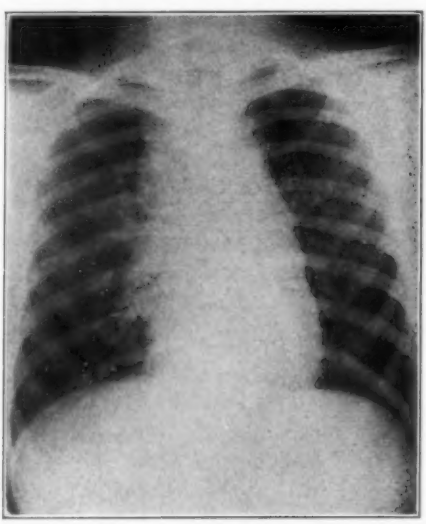

Fig. 6.—Case 12, seven weeks later, after six exposures to roentgen irradiation.

themselves in the left neck glands because of the course of the thoracic duct. This seems a reasonable theory, and indicates the importance of

directing local treatment to the abdomen as well as to the neck in cases in which the only clinical involvement is apparently cervical.

In our Case 15, in many ways similar to an instance in a young infant reported by Priesel and Winkelbauer,[23] the first involvement noted was in the bones of the skull. This patient had a sarcomatous type of Hodgkin's disease, which ran a very rapid course, and showed a marked tendency to bone involvement, though lymph nodes, spleen, and liver were also infiltrated.

During the course of the disease in our patients there was usually appearance of involvement in groups of glands not at first enlarged. We have seen the mediastinal nodes involved in 9 children. (See Figs.

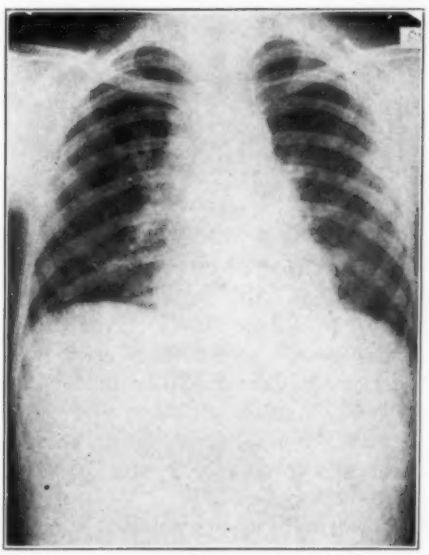

Fig. 7.—Case 12, four and one-half months later, after four more irradiations to mediastinum.

5, 6, and 7.) This involvement is, in its earlier stages, usually not discoverable without x-ray examination. The spleen has been the site of involvement in the course of 12 of our cases, the liver apparently in 8. These organs tend to be involved late, and their enlargement is a bad prognostic sign.

The cutaneous manifestations of Hodgkin's disease are usually considered to be of two general types. The first group includes more or less pruritic, nonspecific lesions, macules and papules, with a tendency to lichenification from chronic irritation. The second includes the actual infiltration of the skin with the Hodgkin's tissue. Lesions of the former type have been recorded in children by Feer[10] and Corbeille.[8] In the case of Wollstein and McLean[26] there were skin lesions apparently of

the second type. Both forms of skin involvement would seem to be somewhat less common in children than in adults. In our patients no true infiltration of the skin was seen. In 2 there were skin lesions suggesting scabies at admission, in one a few brownish macules with fine scaling at their borders. This was diagnosed as dermatophytosis. All these eruptions cleared on appropriate local treatment, and did not recur.

FEVER

The temperature in Hodgkin's disease may be of four general types: (1) absence of any fever, or very slight irregularities from the normal; (2) irregular, inconstant elevations of temperature; (3) daily remittent, swinging or "picket-fence" temperatures, in which there is a sharp afternoon and evening rise to 104° F., or even more, often accompanied by a chill, with a morning remission; (4) the recurrent, relapsing, or Pel-Ebstein type. In the latter type there are regular recurrences of a more or less steady elevation at 102° or more, each lasting usually more than a week, and followed by a relatively equal period of normal temperature until the next rise begins.

We have not observed our children constantly through prolonged periods of illness, and therefore cannot give exact figures on the frequency of fever in them. In 10 of them, some observed over reasonable periods, no fever was noted. In 7 others there were irregular variations from normal. In 4 cases we have observed daily remittant fevers lasting over periods of months, sometimes merging into the Pel-Ebstein picture. The latter type has occurred also in 4 instances. In one of these, Case 5, the total duration of illness was nine years. A daily swinging temperature began in the seventh year, and about three months before death was changed to a characteristic Pel-Ebstein curve, which persisted until the end.

Although the children were often surprisingly active and seemed to feel quite well during periods of very marked daily swinging and Pel-Ebstein temperatures, these reactions were usually the accompaniment of an advancing process, and commonly occurred during the later course of the disease. Beyond this fact we have found no characteristic manifestations accompanying these fevers. In none of our 5 patients known to be living at present has a temperature of these two types as yet been observed. In the boy who has lived the longest—twelve years—we have seen no fever, and have no history of it.

EXAMINATION OF THE BLOOD

It is the opinion of most authorities that the course of Hodgkin's disease is usually marked by moderate though more or less characteristic changes in the blood picture. There is general agreement that most patients have an increasing anemia, particularly in the later stages of the process. Ziegler,[3] Bunting,[5] Falconer,[45] Isaacs,[46] and others agree

that there is a slight leucocytosis in most cases, usually tending to increase as the disease progresses, with a tendency to an early increase and a later decrease in the lymphocytes. Bunting and others have also called attention to a moderate and constant increase in the monocytes and platelets. Leucopenia sometimes occurs. Straube[47] believes it to be present most frequently in the abdominal and generalized processes. Ziegler thought that eosinophilia was common, but later articles do not substantiate this, though many cases have been reported with eosinophilia, sometimes of more than 50 per cent (Sears[48]).

There is less data from the childhood group of cases in the literature. Feer[10] states that leucocytosis is seldom marked in children with Hodgkin's disease, but that leucopenia is more common in childhood cases than in adults, while the monocytes are also more numerous. Corbeille[8] found that in her cases examination of the blood revealed nothing striking, and the differential counts did not show any characteristic deviation from the normal. Thursfield[49] says, "It must be repeated, and with emphasis, that there is no alteration of the blood picture which affords any aid in the diagnosis of lymphadenoma, except, of course, in so far as it serves to exclude the presence of leucemia."

Blood findings in our patients showed so little in the way of characteristic changes that we have not grouped them in a single table. In every fatal case in which repeated examinations were made over the months preceding death, a progressive anemia developed. In eighty-seven leucocyte counts done on a total of 20 patients, the white cells have been over 10,000 in twenty determinations, and under 5,000 in twenty-two. Thus the majority have been within normal limits. Leucopenia showed much more tendency to maintain itself than leucocytosis, high counts usually occurring not more than once in any one patient. In general, as noted by Isaacs,[46] there was more consistent leucopenia in the sarcomatous cases. Leucocytosis was followed by leucopenia in Cases 5 and 9. No child who developed a leucopenia of under 3,000 is now living. On the other hand, the more acute cases have usually shown high leucocyte counts, as in Cases 15 and 19.

There was no characteristic trend in polymorphonuclear and lymphocyte relationship during the progress of the majority of our patients. Of the 6 fatal cases whose blood was most carefully studied, there were 3 in which the polymorphonuclear percentage gradually rose in proportion to the lymphocytes, 2 in which the reverse occurred, and 1 in which there was no definite change. One acute case, apparently of the sarcomatous type (Case 14), showed 64 per cent lymphocytes in a total of 8,400 white cells. No consistent increase in eosinophiles was seen, these cells reaching 10 per cent or more in four counts on 3 different patients. In all other instances, eosinophiles were not especially increased. The percentage of monocytes, however, was ten or above in sixteen counts from 10 different patients, though the monocyte count

did not show any definite trend during the progress of the disease. We have not made sufficient observations of the platelets to record them here.

In general, our children with Hodgkin's disease have shown a progressive anemia, a tendency to lowered leucocyte counts, and an increase in monocytes. These changes, with the exception of the first, have been so slight and so relatively inconstant, that our experience would lead us to consider the blood findings of little diagnostic importance. With repeated studies of a patient's blood, however, some confirmatory evidence is obtained.

DURATION OF DISEASE AND EFFECT OF TREATMENT

The general opinion as stated in the literature is that the average patient with Hodgkin's disease lives from two to three years, and that in the child the duration tends to be shorter. Minot and Isaacs[7] found an average duration in 401 patients of all ages dying of lymphoblastoma, of 2.76 years. In the Hodgkin's type of lymphoblastoma, 75 per cent of males under fourteen years died within 2.5 years, and only 5 per cent lived more than six years. The survival among girls was somewhat greater, as, in those under fourteen years, 50 per cent died within 2.5 years and 30 per cent lived more than six years. Our group of cases from the literature totals 41 children who have died with the disease. Their average duration was 1.8 years, the average duration in the female cases being 1.35 years, or less than that for the total group. These figures are probably low because of the tendency for unusual, fulminating cases to be reported.

TABLE VI

DURATION OF DISEASE AND EFFECT OF TREATMENT

	16 PATIENTS KNOWN TO HAVE DIED			5 LIVING PATIENTS
	TOTAL GROUP	SATISFACTORILY TREATED	UNSATISFACTORILY TREATED	
Average duration before admission	1.72 years	1.64 years	1.82 years	2.4 years
Average duration after admission	1.73 years	2.66 years	0.5 years	1.8 years
Average total duration	3.45 years	4.3 years	2.32 years	4.2 years
Average number irradiations per patient	15.25	23.7	1.5	22.5

It should be added that, of the cases reported in the literature as living (Table I), 3 of the 4 who have lived more than five years were girls. One of these, reported from this clinic by Cowie[25] in 1923, was treated intensively by x-ray, and was at that time well six years after the onset of symptoms. We have not been able to see her in the clinic since 1926, at which time an adenomatous thyroid and a tubular adenoma of the breast were surgically removed. There was no demonstrable

enlargement of lymphoid tissue. It is now fifteen years since the onset of her symptoms, and she has written us lately that she is in good health, though she has recently observed a small swelling on the right side of her neck.

Of our own cases, 16 are known to be dead, with an average duration of 3.45 years, and 5 to be living at present. We have tabulated these cases as to duration before and after admission and as to the general type of treatment given, as will be explained later. (Table VI.) Neither of our 2 female patients is still living; in one (Case 11) the duration of life was 2.2 years, or less than our average figure, the other (Case 4) lived more than nine years, dying of tuberculosis associated with Hodgkin's disease.

It is extremely difficult to evaluate the effect of treatment in this disease and a discussion of the subject must be prefaced by a few words as to the usual course of the process. There seem to be certain definitely fulminating cases, such as in our Patients 14, 15, 17, and 19, in whom a fatal outcome occurred in from three to eight months after the onset of symptoms. These contrast strongly with the majority of cases, in which it may be a year or more before the child is brought to the clinic. In the former type the course is definitely and swiftly downhill, usually with progressive emaciation and anemia, multiple, rapidly enlarging areas of infiltration, and irregular fever. In the latter, more common form, the course is variable and insidious, with remissions and relapses, and no anemia, fever, or emaciation may be seen for months or years in untreated cases. Thus, in our Case 21, seen first four months after the onset of swelling of the left side of the neck, no treatment was given (except a biopsy of one of several enlarged glands), and the patient six months later showed a gain of three pounds in weight and as good condition locally and generally as before.

Two important factors thus confuse the evaluation of therapy. The first is the variable course of the disease. The second is the fact, shown by Minot and Isaacs,[7] that the patients who come to irradiation or other therapy tend to be those who have more prolonged courses. These not only can be shown to have lived longer before therapy is begun, but they naturally tend to pursue treatment over a longer period than the rapidly advancing cases. This can be shown in our own group of living patients (Table VI), who had lived an average of 2.4 years from onset until they entered the hospital, as against 1.72 years for the deceased patients.

Our treatment has been almost entirely by roentgen irradiation, none of the patients having received radium. Those in charge of radiation therapy at the hospital[50] state that more even irradiation can be secured with x-ray, and more extensive areas can be exposed in a shorter period of time. Moreover, there is the further economic factor in favor of the general usage of x-ray that it is more widely available

for patients than radium. Fowler's solution, iron, and transfusions have been used in some patients, but more or less symptomatically, to combat increasing anemia and debility.

Our use of irradiation has of late changed from a program of occasional applications of medium, or rarely short, wave-length therapy, directed toward areas of clinically apparent glandular enlargement, to one of repeated intensive courses of medium wave-length therapy to all gland-bearing areas. Thus, the Department of Radiation Terapy[50] now begins the treatment of a child with clinical enlargement in the left side of the neck only, as follows: On each of twelve successive days, the child is given one exposure of 200 R units at the skin surface. These exposures are given successively over the following twelve areas, one area being irradiated daily: right and left cervical, right and left axillary, and in the same way the two inguinal regions, each half of the chest and of the upper and lower back. The patient is then seen again six weeks later, and the entire series usually repeated. Repetition at this interval is continued until the process has either disappeared or has apparently reached a more or less irreducible clinical standstill. The patient is then watched for evidence of recurring activity, either locally or elsewhere. As this occurs, the same procedure as at the beginning is repeated.

This plan follows that advocated by Desjardins,[51] and has the advantage that such subclinical involvement as may be present in other areas is possibly inhibited, as well as that which is clinically apparent. The importance of chest x-ray plates as a means of discovering mediastinal involvement is to be stressed. Leucopenia is not considered a contraindication to this therapy unless the count falls below 2,000. Actually, we have not seen this occur during the course of any children treated in this manner. There have been no other detrimental reactions associated with this plan.

In presenting the results of therapy in our cases it should be stated that most of the children were treated before this program was begun. However, we have grouped the 16 patients who have died, in two general classes (Table VI): those in whom what was at the time considered satisfactory treatment was applied, and those whose treatment was more or less unsatisfactory. In general, the latter group was either seen only in the Out-Patient Department, or removed against advice, or were not brought back at the appointed intervals for treatment.

An examination of Table VI shows an average total duration in the 16 patients who have died, of 3.45 years. Of this period, averages show that almost exactly half of the time elapsed before the patients were brought to the hospital. The children considered as satisfactorily treated lived an average of 4.3 years, of which 1.64 years elapsed before and 2.66 years after treatment was begun. The cases regarded as

unsatisfactorily treated averaged 1.82 years before being seen at the hospital, and lived only an average of 0.5 years afterward. These figures would appear to argue strongly for adequate therapy, but if the last group are considered as individuals, this seems a false impression. These patients were Cases 7, 8, 13, 14, 15, 17, and 19. One of

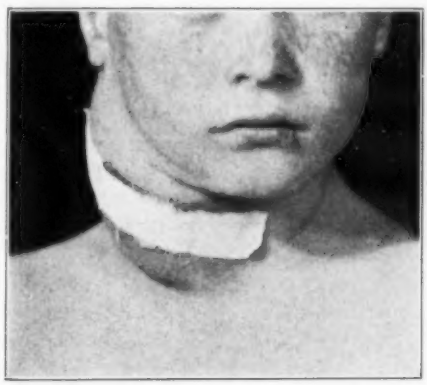

Fig. 8.—Case 20. Typical appearance of cervical involvement after biopsy at admission. Note scar of earlier biopsy on left side of neck.

Fig. 9.—Case 20, eight weeks later, after six irradiations.

them had the disease for eight years before coming to the hospital. Of the other 6, only one had an illness of more than one year before admission, and the remaining 5 were definitely of the fulminating type, with total illnesses of a year or less. Thus, these patients cannot logically be used as controls for the satisfactorily treated group.

Analysis of the figures in the 5 patients known to be living shows that no argument for therapy can be made from them. It is notable

that their average duration before coming under our care was considerably longer than the same period in the group of dead patients. Their duration of life to date has averaged 4.2 years, or slightly less than that in the first group of deceased cases. Of the living patients, one (Case 6) seems well twelve years after the onset of symptoms. This boy had roentgen therapy about twice a month in another city for over five years before coming to the clinic. Since then he has had a total of twenty-four irradiations here. The other 4 children have lived three years or less and are all occasionally admitted for treatment.

In spite of the lack of absolute proof of benefit from irradiation, there are certain instances in which it seems to have much value. It is impossible to give in detail the immediate response to therapy, but in many of the patients, such as Cases 4, 5, and 20, there were repeated

Fig. 10.—Case 20, fourteen months later, after twenty-one irradiations.

occasions of striking symptomatic relief and tumor involution following a few exposures to irradiation. (Figs. 8, 9, and 10.) Benefit is particularly evident in patients who develop mediastinal involvement, as seen in Case 12 (Figs. 5, 6, and 7), in whom not only a broad mediastinal shadow but also clinical symptoms were made to diminish by its use. One cannot help being inclined toward the use of x-ray by the case of Cowie's previously mentioned, and by our own boy who is in apparent good health twelve years after the onset of his symptoms. Moreover, the fact that many of our children have been well enough to attend school and lead normal lives between such treatments makes one hopeful in continuing its use.

CONCLUSIONS

1. Hodgkin's disease shows an even greater tendency to attack the male sex in childhood than in other age periods. Over four-fifths

(81.5 per cent) of 108 collected childhood cases were in boys. In the author's 23 cases, 91.1 per cent were in boys. There is also a marked predominance of the male sex in childhood cases of leucemia and lymphosarcoma.

2. The onset of Hodgkin's disease in childhood showed no significant relationship to preceding illness or to foci of infection, in 23 cases studied. A familial predisposition to the disease is sometimes seen.

3. Secondary invasion with tuberculosis is fairly frequently observed in children with Hodgkin's disease, and the two diseases may coexist for years in the same patient. There is a marked tendency for the tuberculin test to remain negative in the presence of Hodgkin's disease, both in children and in adults. The disease may cause tuberculin anergy.

4. In none of 5 children with Hodgkin's disease tested with avian tuberculin was there a positive reaction.

5. Results of tuberculin tests are not satisfactory evidence as to an etiologic relationship between the two diseases.

6. The histopathology as well as the sex ratios of Hodgkin's disease in childhood are suggestive of a neoplastic rather than a granulomatous process.

7. In childhood the left cervical region is considerably more frequently invaded early than the right, which may be evidence that the disease often has an unsuspected abdominal onset. Invasion of mediastinal glands is common, and often not apparent without x-ray examination. Splenic and hepatic involvement is common late in the disease, and is of bad prognostic import. Cutaneous manifestations are comparatively infrequent in childhood.

8. Septic and recurrent relapsing (Pel-Ebstein) temperatures are not rare in children with Hodgkin's disease, and are bad prognostic signs.

9. Blood studies of 20 children with Hodgkin's disease showed a progressive anemia, and a tendency to leucopenia and to an increase in monocytes.

10. Though fulminating, rapidly fatal Hodgkin's disease is common in childhood; the average duration of sixteen fatal cases was 3.45 years. Five living patients have survived an average of 4.2 years. The average duration of 41 fatal cases from the literature was 1.8 years. Cases beginning in childhood and now alive twelve and fifteen years after onset have been seen in this clinic.

11. The use of roentgen irradiation is recommended, though absolute proof of its ultimate benefit cannot be adduced from our cases. A program for its use is suggested.

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319 Longwood Avenue

MULTIPLE ULCERS OF THE STOMACH IN A NEWBORN INFANT WITH STAPHYLOCOCCUS SEPTICEMIA

ETHEL C. DUNHAM, M.D.
AND
MERRIWELL T. SHELTON, M.D.
NEW HAVEN, CONN.

A NEWBORN infant with multiple ulcers of the stomach was observed on the Pediatric Service of the New Haven Hospital. The case is reported because of the rarity of the condition in young infants and because the etiology of the ulcers in this case seemed to be well established.

CASE REPORT

S. A., a white male, was born at home and admitted to the New Haven Hospital when about twenty-four hours old because he was a small premature infant and needed special care. The mother's history stated that she had developed "grippe" during the last week of pregnancy and that the membranes ruptured forty-eight hours before delivery. The infant was born spontaneously; cyanosis was marked but disappeared after "stimulation."

On examination the infant was small (weight 1,730 gm.), the color good, but the cry feeble. The heart and lungs were normal; the liver was palpable three finger-breadths below the costal margin; the spleen was not felt. The examination was otherwise negative except for conjunctivitis. Smears made from the pus from the eyes showed gram-negative intracellular diplococci. The Kahn test was negative. Two blood cultures, taken twenty-four and forty-eight hours after admission, were negative. There were 25,200 white blood cells, with 47 per cent polymorphonuclear cells and 37 per cent lymphocytes.

During the first night in the hospital the infant had frequent severe cyanotic attacks. At one time the respirations ceased, but were resumed under artificial respiration, caffeine sodium benzoate subcutaneously, and inhalations of a mixture of carbon dioxide (5 per cent) and oxygen (95 per cent). On the second day in the hospital, when the infant was two days old, he became distended and vomited frequently; jaundice appeared and increased rapidly. In spite of several hypodermoclyses of normal salt solution the condition of the infant became gradually worse. When three days old a profuse hemorrhage from the mouth and nose occurred. Whole blood was given intramuscularly and intravenously but the infant died at the age of five days. A blood culture, taken by cardiac puncture immediately after death, showed staphylococci in broth and numerous deep colonies in plate cultures. From a culture of the peritoneal fluid staphylococci and nonhemolytic streptococci were grown.

A postmortem examination was made and the chief findings were in the umbilicus, stomach, and lungs. On gross examination the stump of the umbilical cord was

From the Departments of Pediatrics and Pathology, Yale University School of Medicine, New Haven Hospital, and U. S. Children's Bureau (Studies of Neonatal Morbidity and Mortality).

attached, blue black in appearance, and the skin for approximately 1 cm. surrounding the umbilicus was light red in color.

On opening the abdominal cavity a few cubic centimeters of clear yellow fluid were found. The intestines appeared normal; the liver border was well down below the costal margin. The stomach was slightly distended and the serosal surface appeared intact, but beneath the serosa could be seen numerous minute rounded zones which had a yellow opaque appearance. These zones, when examined from

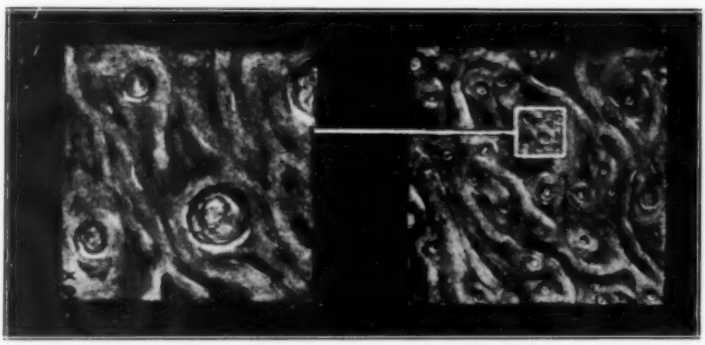

Fig. 1.—Drawing showing multiple lesions of the stomach.

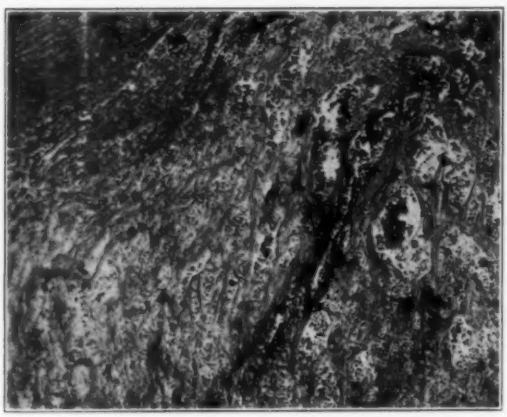

Fig. 2.—Photograph of histologic section through umbilicus, showing organizing thrombus in umbilical vein (×125).

the mucosal surface, were found to be small rounded ulcerations with ragged undermined edges (Fig. 1). There was no evidence of any exudative reaction or hemorrhage around the periphery of the ulcerations. The mucosal surface between the ulcerated areas appeared normal.

The pleural cavities contained no fluid and the pleural surfaces were smooth. Both lungs were quite firm and held their shape well. On section numerous areas of pneumonic consolidation were found.

Microscopic sections taken through the umbilicus revealed an acute omphalitis

conforming to the picture described by Creadick.[1] There was an organizing thrombus in the umbilical vein (Fig. 2). The tissues near and surrounding the vein showed a cellular reaction and, when stained for organisms, the tissues of the umbilicus showed numerous cocci scattered throughout.

Microscopic examination of the wall of the stomach revealed numerous small ulcerated areas showing no cellular reaction around the bases of the ulcers, but

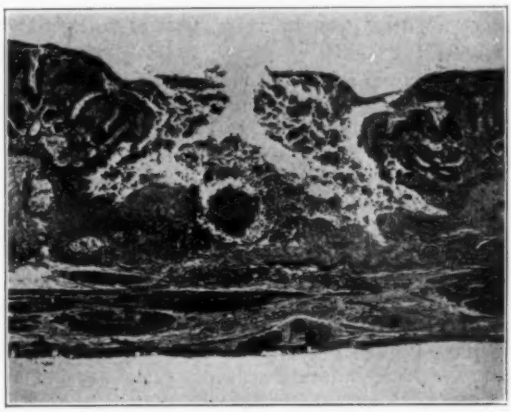

Fig. 3.—Section through ulcer, showing thrombus in vessel at base (×65).

Fig. 4.—Section of lung showing arterioles filled with thrombi (×125).

definite thrombi were present in the vessels (Fig. 3). Microscopic preparations stained for organisms showed clumps of cocci in the necrotic tissue, but no organisms in the thrombi in the vessels.

Microscopic examination of sections of both lungs disclosed scattered areas in which arterioles were filled with thrombi. The tissues surrounding these arterioles were packed with red blood cells, fibrin, and, in many places, numerous mononuclear and polymorphonuclear leucocytes (Fig. 4). In many of the alveoli were

found small collections of noncellular material which took the eosin stain. Clumps of cocci were present in many of the bronchioles. Areas of atelectasis were present in both lungs.

Cultures made postmortem from the heart's blood and from the liver showed *Staphylococcus albus;* those from the lungs, bronchi, and stomach showed *Staphylococcus aureus* and *Bacillus influenzae;* those of the throat and jejunum *Staphylococcus albus, Staphylococcus aureus,* and *Bacillus influenzae;* those of the ileum and colon *Staphylococcus aureus, Bacillus influenzae* and an unidentified gram-negative rod; those of the spleen, *Staphylococcus aureus;* those of the right kidney *Staphylococcus aureus* and *albus.*

The anatomic diagnosis was acute omphalitis; thrombi in gastric and pulmonary vessels; multiple gastric ulcers; focal pneumonia, and partial pulmonary atelectasis; prematurity.

COMMENT

Evidence for an acute omphalitis as the source of general blood stream infection was present in the case reported. The thrombophlebitis of the umbilical vein was characteristic and the presence of organisms was demonstrated in sections of the umbilical region. The organisms, staphylococci, were found on culture of the blood immediately after death. It is difficult to explain the fact that they were not found in two blood cultures made before death. Lesions were demonstrated in the stomach and lungs from which staphylococci were grown. Although the lesions in the stomach are described as ulcers, it is probable that they were similar to those described in the lungs but that the appearance was altered by the action of the gastric juice at the point where the circulation had been interfered with. These lesions, as well as those in the lungs, were regarded as embolic in origin.

REVIEW OF LITERATURE

Hurst and Stewart,[2] in discussing the etiology of gastric ulcers, state that "acute ulcers of the stomach are occasionally found after death from acute septic infections, such as septicemia. . . ." They record that acute ulcers have been produced experimentally in animals by the injection of cultures of *Staphylococcus aureus.*

Reports of cases of multiple ulcers of the stomach in infants are rare. Theile[3] records 8 cases of ulcer of the stomach occurring in infants under one month of age, in 4 of which the ulcers were described as "numerous" or "multiple." Homén[4] reported a case of multiple ulcers of the stomach with clinical and pathologic findings, but there was no record of blood and tissue cultures having been made. Butka[5] reported the case of an infant who, dying on the fourth day of life, showed postmortem a perforated ulcer as well as other areas of necrosis of the mucous membranes of the stomach. Ritter[6] found at postmortem examination of a newborn infant a perforation as well as what he described as three dark elevated lesions on the anterior wall of the stomach in the midline.

Seeds[7] reported the case of a ten-day-old infant with a single ulcer of the stomach who, although blood cultures were not made, had with little doubt, a staphylococcus septicemia because at autopsy minute vegetations were found on the mitral valve and both lungs were studded with necrotic areas. Microscopically gram-positive cocci were found in the submucosa of the ulcer of the stomach as well as in the necrotic areas in the lungs.

SUMMARY

A case of multiple ulcers of the stomach in an infant dying at the age of five days is reported. These ulcers were regarded as the result of thrombi in the gastric vessels arising from an infection in the umbilical cord.

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RUPTURE OF THE STOMACH IN NEWBORN INFANTS

Report of Two Cases

Ethel C. Dunham, M.D.
and
Richard M. Goldstein, M.D.
New Haven, Conn.

TWO cases of rupture of the stomach occurring in newborn infants are here reported because of the rarity of the condition. As will be pointed out, only 9 other such cases have been described. Abstracts of the case histories with clinical and pathologic findings follow.

Case 1.—N. S., a white male, was born Sept. 7, 1929, in the New Haven Hospital. The mother developed a severe toxemia and was delivered at term by cesarean section. The infant weighed 4,166 gm. and appeared normal at birth. On the fourth day of life the temperature became elevated. The infant vomited and about six hours later became acutely ill and was found to be distended and to have edema of the abdominal wall. The leucocyte count was 4,000, polymorphonuclears 38 per cent, lymphocytes 53 per cent. No definite clinical diagnosis was made at this time, although the symptoms could best be explained by peritonitis. A subcutaneous injection of saline, and a transfusion of blood were then given and the infant's stomach was lavaged. The following day, although the infant's condition seemed somewhat improved, the distention and vomiting continued. At this time a roentgenogram, taken after a rectal injection of barium had been given, showed that there was no evidence of obstruction in the large intestine. Reexamination of the film several days later revealed the fact that a small amount of air had been present in the peritoneal cavity at the time the roentgenogram was taken. During this period, however, the infant's condition had greatly improved, the abdominal distention had decreased, stools were passed daily, fluids were taken well, and there was no vomiting. The temperature remained normal most of the time. A blood culture taken two days after the onset of the illness showed *B. coli*, as did six subsequent cultures made on the sixth, ninth, fourteenth, sixteenth, seventeenth, and eighteenth days.

On the thirteenth day of life a mass was palpated in the left flank and an exploratory operation was performed. On going through the peritoneum in the region where the mass had been felt there was an escape of gas and of thin yellowish fluid having the odor of colon bacillus pus. No perforation was found in the intestines, but an accumulation of pus was found walled off near the upper pole of the left kidney. This was thought to be an abscess and was opened and drained.

On the following day after the first feeding, undigested milk appeared in the wound. The presence of a fistulous opening was confirmed by fluoroscopic examination after a barium meal.

From the Departments of Pediatrics and Pathology, Yale University School of Medicine, and U. S. Children's Bureau (Studies of Neonatal Morbidity and Mortality).

An attempt was made to repair the perforation in the stomach, but this was unsuccessful. Blood cultures continued to be positive for *B. coli*, and the infant died on the twenty-first day.

The final clinical diagnosis was rupture of the stomach, peritonitis, *B. coli septicemia.*

An autopsy was performed four hours after death. The skin and subcutaneous tissue over the abdomen were edematous. There was no free fluid in the peritoneal cavity. The stomach, transverse and descending colon, and several coils of small intestine were bound together by fibrinous and fibrous adhesions. When the stomach was dissected free, a suture line measuring 1 cm. was seen on the greater curvature at the cardia. On freeing the spleen several small pockets of thick yellow pus were encountered between the spleen and the diaphragm. Similar pockets of pus were scattered between the coils of intestine in this region. When the stomach was opened, it was seen that the mucosa, except for the site of rupture, was intact and the usual rugae were present. The remaining portions of the gastrointestinal tract showed no abnormalities aside from the serosal and peritoneal reaction.

Serial sections were taken through the area of rupture. The gastric mucosa up to the edge of the rupture appeared normal. There was no cellular infiltration or hemorrhage. The point of rupture was surrounded by a thin wall of homogeneous, necrotic débris which took the eosin stain and was surrounded by a narrow zone of tissue infiltrated with mononuclear leucocytes and extravasated red blood cells. Farther from the lesion the mucosa and deeper layers of the stomach were apparently normal. Sections of the jejunum and ileum showed that the serosal surfaces were thickened by an infiltration of mononuclear leucocytes; the mucosae were intact and free from cellular infiltration or hemorrhage. Sections of the lungs showed focal pneumonia.

The anatomic diagnosis was perforation of the stomach; localized peritoneal abscess; subdiaphragmatic abscess (left); partial obstruction of the sigmoid colon; fecal fistula; focal pneumonia; recent laparotomy for drainage of peritoneal cavity, and suture of stomach.

Case 2.—B. B., a white male, was born prematurely Sept. 11, 1930, in the New Haven Hospital. The mother was a healthy primipara, twenty-one years old. The labor was normal and the delivery spontaneous. The birth weight was 1,960 gm. The infant's general condition was good, but the temperature was subnormal (35.6° C.). On examination the infant, although small, appeared normal except for a bilateral harelip and cleft palate. Feeding with modified cow's milk was begun about twelve hours after birth. The infant vomited bile-stained material following the first feeding and continued to vomit after subsequent feedings. Abdominal distention and increased peristalsis appeared about thirty hours after birth. Two hypodermoclyses were given and at thirty-eight hours lavage and gavage were begun and continued through the next day. A blood culture taken on the third day of life showed colon bacilli in broth and plates. A roentgenogram of the abdomen (flat plate) showed a large quantity of gas in the stomach and intestinal tract. The Wassermann test on the blood serum was negative. Attacks of cyanosis developed, and the infant died at the age of five days. The clinical impression was septicemia; prematurity; harelip, and cleft palate. A blood culture (heart's blood) taken immediately after death showed colon bacilli.

An autopsy was performed thirty-six hours after death. The abdomen was distended and tympanitic. The umbilical stump was dry and firm and the periumbilical tissue was pale yellow; no edema or congestion was seen. Gas escaped when the peritoneal cavity was opened. There were approximately 80 c.c. of yellow brown fluid in the peritoneal cavity. The peritoneal surface of the intestines was red and finely granular, and the loops of intestine were bound together by fibrinous

exudate. This exudate extended evenly from the diaphragm into the pelvis except at the region about the stomach and spleen where it was thicker than elsewhere and blood-tinged. When the liver was turned back, a defect in the stomach wall was seen extending from the insertion of the esophagus for a distance of 1.5 cm. along the greater curvature. The edge of this defect was dark green black with blood clots in the vessels fringing the opening. Externally the stomach showed no other abnormality. Internally the mucosa was intact and smooth except for the above area which formed an opening 3 cm. in circumference. The mucosa of the lower portion of the esophagus was deeply congested. The remaining portions of

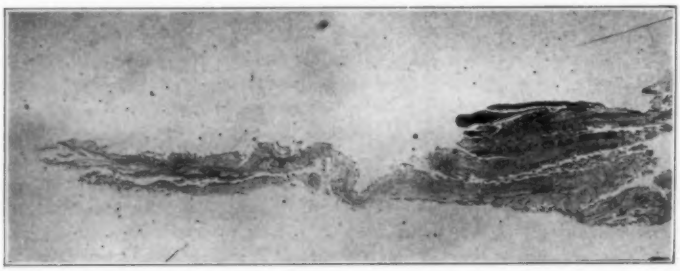

Fig. 1.—(Case 2.) Histologic section through base of ulcer, showing edge of perforation (×15).

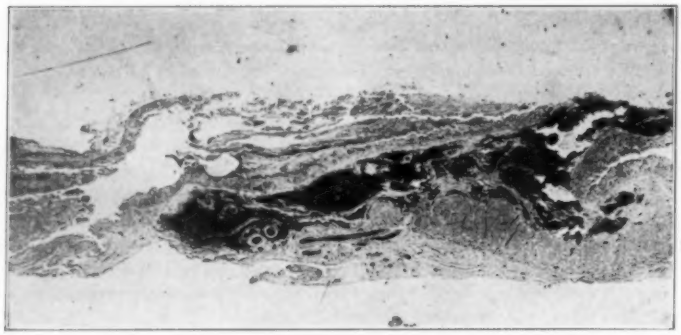

Fig. 2.—(Case 2.) Histologic section taken farther back from base of ulcer, showing hemorrhage into tissues (×15).

the gastrointestinal tract appeared normal except for the fibrinous exudate on the serosal surfaces. The lungs showed focal pneumonia.

Microscopic preparations of the stomach showed no abnormalities except at and adjacent to the point of rupture. The tissue forming the edge of the perforation was composed of submucosa alone. This tissue stained very lightly, only the outlines of cells being visible. Scattered through it were strands of fibrin and small collections of dark blue-staining bacilli. Farther from the opening the submucosa was thicker and some cellular detail could be made out; here and there were hemorrhages in the submucosa; the blood vessels were distended (Fig. 1). In a section made further from the point of rupture (Fig. 2) the structure of the intestine was clearly made out. There was infiltration of mononuclear leucocytes into the mucosa,

submucosa, and muscularis; hemorrhage into the submucosa, and edema of all these tissues. Still farther away from the point of rupture the evidences of hemorrhage were less and less apparent and the tissue appeared normal except for the fibrinocellular exudate on the serosal surface. Sections through the lower portion of the esophagus showed distended blood vessels in the submucosa and serosa. There were extravasated erythrocytes about one small vessel in the serosa. Sections through the umbilicus showed no cellular reaction or edema; those of the lungs showed focal pneumonia.

The anatomic diagnosis was hemorrhage in the wall of the stomach (cardia); gangrene and perforation of the stomach; diffuse peritonitis; prematurity; cleft palate, bilateral.

REVIEW OF LITERATURE

From a review of the literature it is evident that rupture of the stomach in young infants is a rare condition, and that in each case reported the rupture has been considered secondary to the presence of a gastric ulcer.

Theile[1] in 1919 made a comprehensive review of the subject of ulcers of the stomach in children. He found reports of 119 cases which occurred in the neonatal period (under one month). Perforation occurred in only 5 of these cases. Ritter[2] reported a case in 1882 which was not included in Theile's series. Three additional cases have been reported since 1919 by Lee and Wells,[3] Butka[4] and Stern, Perkins and Nesse.[5]

The findings in the 9 cases of ruptured "gastric ulcer" in newborn infants already reported, as well as in the 2 cases reported in this paper, are summarized in Table I.

The age of onset of the symptoms varied between twelve hours and eleven days. Five of the infants were males, 2 were females, and in 4 cases the sex of the infant was not stated. Vomiting occurred in 8 cases, in 6 of which blood, and in 2 bile, was present in the vomitus. In 4 of the cases the stools contained blood. Abdominal distention as a sign of peritonitis was noted in 3 cases.

The "ulcers" were described in some cases as having round and sharp cut edges and in others as torn. The perforation occurred on the lesser curvature of the stomach in 4 cases, on the greater in 6; anteriorly in 3, posteriorly in 5; near the pylorus in 3, near the cardia in 5, and in the middle portion of the stomach in 1 case. The ulcers were single in all but 2 of the cases reported, those of Butka and of Ritter. Butka, in describing the perforation, states that "other areas of necrosis of the mucosa were present but had not progressed to ulcer formation." Ritter described, besides the perforated ulcer, "three black elevations" the nature of which is not clear.

In only two of the reported cases were roentgenograms of the gastrointestinal tract made. In the case reported by Stern, Perkins and Nesse, the infant, who vomited bile on the day after birth and developed abdominal distention the following day, was given barium by stomach tube

TABLE I

REPORTED CASES OF PERFORATION OF THE STOMACH IN NEWBORN INFANTS

AUTHOR	DATE REPORTED	SEX	AGE AT ONSET OF SYMPTOMS	BLOOD PRESENT IN		SITE OF PERFORATION IN STOMACH					
						CURVATURE		ANT. WALL	POST. WALL	PYLORUS	CARDIA
				VOMITUS	STOOL	LESSER	GREATER				
Siebold	1825	–	2 days	+		+					
Busch	1836	–	7 days	+	+		+	+		+	
Binz	1865	F	11 days				+	+			
Ritter	1882	F	12 hours	+				+			
Sawtel	1885	M	3 days	+	+	+			+		+
Bisset	1905	M	24 hours		+	+			+		+
Lee and Wells	1923	M	10 days				+		+	+	
Butka	1927	–	4 days	+	+		+				+
Stern, et al.	1929	–	1 day			+			+	+	
Authors' case	1933	M	4 days				+				+
Authors' case	1933	M	2 days	+			+		+		+

and hourly films were taken. A persistent niche was observed on the lesser curvature of the stomach near the pylorus as well as an accumulation of free gas along the lateral abdominal walls. A diagnosis of gastric perforation was made. A laparotomy was performed and a perforation a quarter of an inch in diameter on the lesser curvature posteriorly was found and closed, but the infant died three days later. In the case reported by Lee and Wells, a diagnosis of pyloric obstruction was made by roentgenogram. At operation, adhesions of the intestine to the pylorus were found, but it was not until postmortem examination was made that a perforation was found on the posterior wall of the stomach. The authors concluded that an ulcer of the stomach, ruptured during intrauterine life, had become walled off by adhesions.

In those cases in which histologic examinations of the stomach at the site of perforation were made, the changes described were those of necrosis and hemorrhage into the tissue near the point of rupture. A cellular reaction similar to that found in peptic ulcer has not been found nor have evidences of thrombosis or embolism.

Blood cultures have not been taken in any of the cases reported.

ETIOLOGY

The cause of "ulcers" of the stomach in young infants is obscure. Shore,[6] in discussing these lesions in children, regards the mechanism of their formation as a local disturbance in circulation which, from the action of the gastric juice, leads to necrosis and ulceration. He mentions as causes of this vascular disturbance congestion, embolism, thrombosis, vascular disease, direct injury to the mucosa, and nervous influences. Weiss and Mallory[7] have recently called attention to vomiting as a cause of lacerations or ulcers in the cardiac end of the stomach. Fulton[8] has shown a relation between focal lesions in the hypothalamus and ulcers in the gastrointestinal tract. The possibility of some congenital defect in the structure of the stomach as the underlying cause of rupture must be considered. In the light of the well-known occurrence of so-called "spontaneous rupture of the intestine" in the newborn infant, which is due probably to obstruction and trauma during birth, as reported by Russell[9] and others, a similar mechanism perhaps should be considered in connection with rupture of the stomach. No case reports of such "spontaneous" rupture of the stomach have, however, been found.

It has not been possible to demonstrate that any of the etiologic factors suggested by these authors played a rôle in bringing about rupture of the stomach in the cases here reported. There was no history of asphyxia at birth which might lead to congestion nor was there evidence of thrombosis or embolism found postmortem. Moreover, in spite of the fact that both of the infants had a bacteremia, evidence was inconclusive

that a general blood stream infection played a rôle, since thrombi were not demonstrable in the bases of the ulcers; and, although organisms were demonstrated in the tissue around the ulcer in one case, there was no polymorphonuclear reaction.

Direct trauma to the mucous membrane of the stomach was considered as a possible cause of the ulceration in one of our cases (Case 2) because a tube was used for gavage and lavage before the abdominal distention appeared, but it seems highly improbable that a normal mucous membrane could have been damaged by a soft rubber catheter. In the other case, although a tube was introduced into the stomach, trauma from the tube could not have caused rupture, because signs of peritonitis developed before the use of the tube.

Vomiting occurred as one of the initial symptoms in both of the cases reported, but was regarded as probably the result rather than the cause of the abdominal condition.

The brain was examined postmortem in one case (Case 2), but no evidence of a lesion of the hypothalamus could be demonstrated.

SUMMARY

Rupture of the stomach in newborn infants is a rare condition, the etiology of which is obscure. The diagnosis of rupture or of the lesions which lead to it is difficult, but, in the presence of persistent vomiting and abdominal distention, a roentgenogram of the abdomen should always be taken without administration of barium. By this means the presence of free air in the peritoneal cavity—evidence that rupture has already taken place—may be determined. If there is no evidence of free air and the severity of symptoms justifies it, a barium meal may be given or an exploratory operation performed with the hope of determining the cause of the symptoms and of preventing rupture of the stomach.

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AN UNUSUAL CASE OF ESOPHAGEAL OBSTRUCTION IN A CHILD

C. S. Culotta, M.D., and L. N. Claiborn, M.D.
New Haven, Conn.

ESOPHAGEAL obstruction is a well-recognized condition in infancy and childhood. The etiology, excluding the groups resulting from ingestion of caustics and congenital abnormalities, is often obscure. The cases fall into three distinct groups, namely, the congenital, the acquired, and the functional type of obstruction.

LITERATURE

The literature on "congenital anomalies" of the esophagus was reviewed in 1920 by Shaw[1] who collected 150 such cases, and in 1921 by Reynolds and Morrison[2] who collected 214 cases of "congenital atresia" of the esophagus. Numerous case reports have been added to the literature since. No attempt will be made here to discuss the various types of malformation that have been described, except to say that, in general, these malformations are not compatible with life. Within recent years a less severe form of congenital esophageal obstruction has been described by Grieg,[3] Beatty[4] and more recently by Sheldon and Olgovie[5] as a narrowing of the lumen of the esophagus. No demonstrable pathologic changes in the esophageal wall have been found. More will be said about this condition subsequently.

The acquired form of esophageal obstruction is more frequently seen than the congenital type. The etiology is either chemical or bacterial irritation of the esophageal mucosa. That serious strictures result from chemical injury due to caustics and from mechanical injury caused by a foreign body is well known. Lesions of the esophageal mucosa attributable to bacterial and toxic agents have been described during the course of acute infectious diseases. Membranous esophagitis in diphtheria, a pseudomembranous lesion of the esophagus in scarlet fever, ulceration from thrush and also during the course of sepsis and severe gastroenteritis, all these are recognized pathologic lesions of the esophagus (Abt[6]). Messeloff, Shulman and Buckstein,[7] described a case of esophageal obstruction in a child of ten years following an attack of pertussis. The lesion described on esophagoscopy was "considerable thickening and congestion of the mucous membrane" just above the

From the Departments of Pediatrics and Surgery, Yale University School of Medicine and the Pediatric and Surgical Services of the New Haven Hospital.

hiatus. Peptic ulcers at the cardia may conceivably cause obstruction due to the subsequent healing with cicatrization.

The third, the "functional" group of cases, includes those of so-called cardiospasm in which no definite pathologic basis for the obstruction is demonstrable. A great number of cases are described in this group, but authentic cases of cardiospasm are rare. In 1925, Castronovo[8] collected only 8 authentic cases in the literature. The etiology of the condition is obscure.

Fig. 1.—Roentgenogram taken 5/27/29, showing no esophageal obstruction. (Fluid barium meal.)

REPORT OF A CASE

We wish to present the report of a case of esophageal obstruction of unexplained etiology in a child in which recovery followed a plastic operation.

A white male, eight months of age, was admitted to the New Haven Hospital on May 25, 1929; the mother complained that the baby vomited a great deal, that the vomitus sometimes contained blood, and that the child was pale. Although the family history was irrelevant, the past history was of interest. The patient was born one month prematurely; he weighed 2,360 grams at birth, was artificially fed, and gained weight rather slowly. At the age of two months the infant was seen in the Out-Patient Clinic because of repeated upper respiratory infections, failure to gain, and occasional vomiting which occurred following what the mother called "colicky spells." The weight at this time was 3,700 grams.

The patient was not seen again until the time of admission to the hospital six

months later, when he weighed 4,800 grams. The vomiting had become more frequent, the vomitus at times being "coffeeground" in nature. The stools occasionally had been observed to be dark in color. The notable findings on admission were malnutrition and marked pallor. Laboratory studies showed a red blood count of 2,300,000, hemoglobin 28 per cent (Sahli), white blood count 13,000, of which 62 per cent were polymorphonuclear leucocytes, 33 per cent lymphocytes, and 4 per cent transitional cells. Streaks of fresh blood were noted occasionally in the vomitus, and the stools were at times found to be tarry and gave a positive Guaiac test.

A bleeding point high in the gastrointestinal tract due, possibly, to (1) a gastric or duodenal ulcer, (2) an esophageal varix, or (3) an ulceration secondary to a

Fig. 2.—Roentgenogram taken 11/29/29. No demonstrable esophageal lesion.

diaphragmatic hernia was considered the probable source of hemorrhage. A gastrointestinal roentgenologic series following the administration of a fluid barium meal revealed no abnormalities (Fig. 1).

The general condition of the patient improved considerably following repeated small transfusions. An adenoidectomy was performed because of the repeated attacks of upper respiratory infection; there was progressive gain in weight, and the baby was discharged June 13, 1929, much improved, but without diagnosis of the location of the alimentary hemorrhage.

The patient was followed in the Out-Patient Clinic and apparently progressed satisfactorily for several months, despite occasional vomiting. However, in October, 1929, four months after discharge, when the patient was thirteen months old, the vomiting again became severe and at times dark, and the patient's condition became steadily worse. He was readmitted to the ward November 24, 1929. Blood studies

showed a marked anemia with a red blood count of 2,000,000, a hemoglobin of 29 per cent (Sahli). The stools were again noted to be tarry and the vomitus at times "coffeeground" in nature.

A series of roentgenograms of the gastrointestinal tract after a fluid barium meal (Fig. 2) again failed to visualize any abnormalities. Following symptomatic treatment, including transfusions, the patient's general condition improved. A probable diagnosis of gastric or duodenal ulcer was made and on December 14, 1929, an exploratory laparotomy was done. Inspection and palpation of the gastrointestinal tract revealed no pathologic lesion. It was thought, however, that the esophageal foramen might possibly be slightly larger than normal. Following the operation there continued to be some vomiting, but blood was not again found in either vomitus or stools.

Fig. 3.—Roentgenogram taken 1/6/30, showing esophageal obstruction at level just above diaphragm, with moderate dilatation above point of stricture.

In January, 1930, five weeks after operation, roentgenologic studies were repeated. The roentgenograms revealed obstruction to the passage of the barium mixture at the cardiac orifice with a moderate dilatation of the esophagus above the point of stenosis (Fig. 3). On fluoroscopic examination a very small amount of barium was noted to pass through the constricted portion of the esophagus into the stomach.

Attempts to pass soft rubber catheters into the stomach during fluoroscopy failed. Repeated attempts to induce the patient to swallow a silk thread to facilitate dilatation of the structure also failed. Several courses of atropine therapy had no effect in lessening the persistent vomiting. Fluids were retained better than solids.

An esophagoscope was passed, but no information concerning the nature of the stricture was elicited. The vomiting was persistent and severe, and there was definite evidence of esophageal stenosis. Furthermore, the child developed a chronic

pulmonary infection, bronchiectatic in nature, with moderate clubbing of the fingers. The infection was assumed to be the result of repeated aspiration of vomitus.

A second operation, considered imperative, was performed on November 15, 1930. A high left rectus muscle-splitting approach was used. The stomach was opened by an incision in its upper third and the esophageal opening sought for. It was found by palpation to be a small puckered area completely closed. The esophagus was controlled by two traction sutures, and an incision was made in the stomach just below the cardia and the two connected through the strictured area. It was then demonstrated that an annular stricture practically completely closing the cardia had been present. A plastic closure of the wound in the stomach and esophagus comparable to the procedure used in the Horsley pyloroplasty was done. Following closure of this wound a portion of the stomach was sutured well up onto the esophagus so that the line of anastomosis was completely covered with stomach wall. On palpation an adequate opening was found to exist. The gastrotomy was closed, the stomach returned to the peritoneal cavity and the abdominal wound closed in layers in the usual manner. The patient stood the procedure very well. The postoperative course was exceedingly good. The patient was able to retain solids as well as liquids.

On December 29, 1930, about six weeks after operation, roentgenologic examination of the esophagus showed no obstruction to the passage of barium into the stomach. The patient continued to improve and was discharged in May, 1931. His weight at that time, at the age of two years and eight months, was 11.6 kg. He was seen again by one of our nurses in December, 1931, thirteen months after operation, and was found to be in good health. There had been practically no vomiting since the time of discharge and the gain in weight had been steady. More recent information is not available because the family has moved and their present address is unknown to us.

COMMENT

This case presented a difficult diagnostic problem. The history of the presence of blood in the vomitus and in the stools of an infant of eight months suggested the following possibilities: (1) an esophageal, gastric, or duodenal ulcer, (2) an esophageal varix, (3) a diaphragmatic hernia; foreign bodies and blood dyscrasia were ruled out. True peptic ulcers in infancy are rare. In discussing the etiology of melena, von Reuss[9] states that "ulcers are found in the alimentary canal, viz., in the esophagus, stomach, duodenum, and occasionally also lower down in the bowel. These ulcers are either single or multiple . . . the esophageal ulcers are the rarest." Tileston[10] reviewed 40 cases of peptic ulcers of the esophagus, diagnosed at autopsy, and found that this condition occurs from infancy to old age. In 3 cases it was found as the source of bleeding in hemorrhagic disease of the newborn. Hurst and Stewart[11] state that chronic peptic ulcer of the esophagus must be regarded as an extremely rare condition. Chevalier Jackson,[12] on the other hand, believes that the routine use of the esophagoscope in cases of substernal pain and hematemesis of obscure origin would show that peptic ulcer of the esophagus is much less rare than is generally believed. In 4,000 cases of esophageal disease seen during the course of forty-two years, peptic ulcer in the esophagus was diagnosed in 88 cases. Of these 88 cases, 21

were active ulcers and 67 were scars probably due to preceding peptic ulcers. Most of these cases were adults; however, Chevalier Jackson has seen a number of cases of peptic ulcer of the esophagus in children as well.*

Bleeding in children from a point high in the gastrointestinal tract occurs frequently and in a variety of conditions. It is found in infants with severe malnutrition, with marked dehydration, with septicemia and with burns. None of these conditions was present in the subject of this case report. Gastrointestinal bleeding in infants is seen in conditions similar to, if not identical with, Henoch's purpura; signs of purpura and some allergic manifestations are usually seen sooner or later in this rather rare condition. Hematemesis occasionally occurs in diaphragmatic hernia. Greenwald and Steiner[13] reviewed 81 cases and found that this was an extremely unusual symptom in infancy. However, we have seen recently a newborn infant with blood in the vomitus secondary to a small diaphragmatic hernia (confirmed by postmortem examination).†

A complete gastrointestinal series at the time of the first admission of our patient failed to show any pathologic condition (Fig. 1), and a similar examination four months later (patient then one year of age) again proved to be negative (Fig. 2). An exploratory laparotomy at this time failed to show pathologic lesions. However, two months after operation a definite esophageal obstruction was demonstrated roentgenologically for the first time (Fig. 3). It is interesting to speculate as to the sequence of events leading to this condition.

Sheldon and Olgovie[5] in discussing "obstruction of the esophagus in childhood" point out that in cases of congenital narrowing of the esophagus a mild form of obstruction may be missed by a fluid opaque meal but readily detected by the administration of a solid opaque meal. Solid food is not tolerated as well as liquids in these cases. Unfortunately, a solid opaque meal was not tried in our case and it is possible that there did exist originally a moderate amount of congenital narrowing of the esophagus which was not detected by the fluid opaque meal. It is interesting to note that of the 10 cases reported by these authors, 5 were premature infants and 8 of the 10 were males. The subject in our case report was a premature male infant. The symptomatology in this type of case is striking. There is invariably a history of vomiting since birth, the vomiting being more marked when solid food is started. In fact, the vomiting may not begin until solid food is first given. The vomitus usually consisted of undigested food, mucus, and saliva. Sheldon and Olgovie,[5] Beatty[4] and Grieg[3] do not mention the presence of blood in the vomitus in their cases. In a case reported by Graham[14] bleeding did occur, and an ulcerative esophagitis was ob-

*Personal communication.
†Patient seen by Dr. Powers.

served by esophagoscopy. Grieg[3] maintains that the esophageal wall is normal in these cases and any pathologic change that may occur is associated with trauma from instrumentation, repeated retching, or stagnation of food. A vicious cycle is formed. The mechanism seems to be that retained food produces an inflammatory swelling with resulting spasm; aggravation in the degree of obstruction then occurs and periodic attacks of severe vomiting are not infrequent. The bleeding in our case was possibly secondary to the presence of an ulcerative esophagitis. Recently, Weiss and Mallory[15] called attention to lesions of the cardiac orifice of the stomach produced by vomiting. The lesion they describe is a longitudinal laceration of the mucosa at the cardia which they attribute to "pressure changes in the stomach during disturbed mechanisms of vomiting together with regurgitation of gastric juice, . . ." etc.

The sudden cessation of bleeding following the first exploratory operation may be attributed to the rest given to the ulcerative local lesion, food by mouth having been discontinued for approximately three days. The gradual healing of the local lesion resulted in the formation of a fibrous stricture which was easily demonstrated roentgenologically two months following operation. It is plausible to assume, in view of the available facts, that the original basis of the vomiting was a congenital narrowing of the esophagus and that the bleeding was secondary to a local ulcerative lesion resulting from the severe retching and vomiting. Healing of the local inflammatory lesion later produced a cicatricial constriction at the esophageal exit. That this stricture was the end-result of a healed peptic ulcer at the cardia is possible, but repeated roentgenograms were negative, and no signs of this condition were observed at the first operation. However, since roentgen examination, of fundamental importance in other forms of esophageal disease, is usually negative in peptic ulcer of the esophagus and in view of the technical difficulties involved, it is apparent that the possibility of a healed peptic ulcer cannot be ruled out.

True cardiospasm as the etiology of this condition was definitely ruled out in our case by the repeatedly negative roentgenologic examinations, also by esophagoscopy and by operation. Attempts at dilatation with boughies and adequate trials with atropine therapy also failed to result in any improvement.

SUMMARY

An unusual case of esophageal obstruction is reported in a child of two years with a complete cure, following a transgastric plastic operation on the cardia.

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GONORRHEAL PERITONITIS IN FEMALE CHILDREN

ELLIS H. HARRIS, M.D., AND REUBEN BERMAN, M.D.
MINNEAPOLIS, MINNESOTA

GONORRHEAL peritonitis in children is a rare and serious complication of gonorrheal vulvovaginitis. It occurs usually after the age of four years, but has been reported once in a ten-month-old infant. In every instance vaginal discharge, usually accompanied by vulvar inflammation, has been noted. As a rule the discharge had been noted for indefinite periods before the onset of the pathologic condition in the peritoneum.

Since 1886, 25 cases of this disease have been reported in the literature, but the lack of bacteriologic evidence makes the diagnosis uncertain. Wertheim, in 1892, first demonstrated, in a child with acute pelvic peritonitis complicated with salpingitis, that the gonococcus can live upon the human peritoneum. Since then 7 additional cases have been reported in female children below the age of puberty, with positive bacteriologic findings. An excellent summary of this subject, up to 1901, can be found in von Brunn's *Peritonitis.*

Symptomatology.—Usually a child suffering from a vulvovaginitis suddenly develops a fever up to about 102° F., which is associated with vomiting and generalized abdominal pain. The gastric symptoms ordinarily precede the pain. Often the pain is localized below the umbilicus, more commonly in the right than in the lower left quadrant. Diarrhea occurs occasionally. Paralytic ileus is less common. Among those children who died, the vomiting continued until signs of shock occurred, death following in from twenty-four to sixty hours. Where recovery occurred, the course of the disease was usually less than one week.

Diagnosis.—In the diagnosis of any acute abdominal condition associated with vulvovaginitis, gonorrheal peritonitis must be considered. Appendicitis, especially if the appendix has ruptured, is the chief condition for differentiation. The points in favor of gonorrheal peritonitis are: first, the presence of vulvovaginitis, especially when proved to be gonorrheal; second, vomiting before the pain; and third, history of exposure to gonorrhea. An absolute diagnosis can be established only by finding gonococci in the peritoneal fluid.

Prognosis.—Of the 25 cases with clinical evidence only (Table I), 5 died, 17 recovered, and for the remaining 3 the outcome was not re-

From the Department of Pediatrics of the University of Minnesota, General Hospital Division.

TABLE I

GONORRHEAL PERITONITIS
TWENTY-FIVE CASES WITH CLINICAL EVIDENCE*

YEAR	AUTHOR	AGE	DIAG. BY	SUMMARY REMARKS	RESULT
1886	Loven	5 yr.	Autopsy	Vulvovaginitis, left ovarian abscess, general peritonitis, gonococci in vagina; steptococci in peritoneal cavity.	Death
1889	Hubert	7 yr.	Operation	Vulvovaginitis and urethritis; general peritonitis, with seropurulent exudate.	Death
1890	Huber	7 yr.	Operation	Vaginitis, inflamed tubes, general peritonitis.	Death
1891	Stevens	4 yr.	Bedside	Vaginal discharge, general peritonitis.	Death
1894	Marfan (1)	9 yr.	Bedside	Vaginal discharge for 6 mo., then general peritonitis.	Recovery
1895	Marfan (2)	11 yr.	Bedside	Scarlatina and diphtheria followed by vaginal discharge and general peritonitis.	Recovery
1896	Baginski	12 yr.	Autopsy	Vulvovaginitis, staphylococci and gonococci; general peritonitis. Autopsy: ovarian abscess, purulent peritonitis.	Death
1898	Braquehaye	4½ yr.	Operation	Gonorrheal vulvovaginitis, general peritonitis. Operation: fibrinous peritoneal exudate. Subsequent recurrent arthritis.	Recovery
1901	Comby (1)	11 yr.	Bedside	Scarlatina and vulvovaginitis, general peritonitis.	Recovery
1901	Comby (2)	10 yr.	Bedside	Scarlatina and vulvovaginitis, general peritonitis.	Recovery
1901	Comby (3)	4 yr.	Bedside	Vulvovaginitis, general peritonitis.	Recovery
1901	Comby (4)	6 yr.	Bedside	Vulvovaginitis, general peritonitis.	Recovery
1901	Comby (5)	12 yr.	Bedside	Typhoid. Vulvovaginitis, general peritonitis.	Recovery
1901	Comby (6)	6 yr.	Bedside	Vulvovaginitis, general peritonitis.	Recovery
1901	Comby (7)	3 yr.	Bedside	Pneumonia, pleurisy followed by vaginitis and general peritonitis. Gonococci in vaginal exudate.	Recovery
1903	Northrup (1)	11 yr.	Operation	History, vaginal discharge, general peritonitis. Operation: injected peritoneum, gonococci in vagina.	Recovery
1903	Northrup (2)	9 yr.	Bedside	History. Sister of above case. Same findings, except no operation.	Recovery
1903	Galvagno (1)	7 yr.	Bedside	History, vulvitis, general peritonitis, gonococci in vagina.	Not reported
1903	Galvagno (2)	4 yr.	Bedside	History, gonococci in vagina, general peritonitis.	Not reported
1903	Galvagno (3)	4 yr.	Bedside	History, gonococci in vagina, general peritonitis.	Not reported

*After table of Hunner and Harris.

TABLE I—CONT'D

YEAR	AUTHOR	AGE	DIAG. BY	SUMMARY REMARKS	RESULT
1904	Dubreulh (1)	12 yr.	Bedside	Vulvitis, general peritonitis, gonococci in vagina.	Recovery
1904	Dubreulh (2)	10 yr.	Bedside	Sister of above case, same evidence.	Recovery
1927	Peignaux	10 mo.	Bedside	Vulvitis, general peritonitis.	Recovery
1930	Rocha	2 yr.	Bedside	Vulvovaginitis, general peritonitis, gonococci in vagina.	Recovery
1931	Macera et al.	5 yr.	Bedside	Vulvovaginitis, general peritonitis, gonococci in vagina.	Recovery

ported. Of those with positive bacteriologic evidence (Table II), 5 died and 4 recovered. Five of the 21 patients who recovered, and 5 of the 10 who died had been operated upon. Thus in this series, the fatality for those operated upon was 50 per cent, and 24 per cent for those conservatively treated.

TABLE II

GONORRHEAL PERITONITIS
NINE CASES WITH BACTERIOLOGIC EVIDENCE

YEAR	AUTHOR	AGE OF PATIENT	DIAGNOSED BY				RESULT
			OBTAINED AT	CULTURE & SMEAR	CULTURE ONLY	SMEAR ONLY	
1897	Mejia	5 yr.	Autopsy	+			Death
1902	Dowd	7 yr.	Operation	Proved gonococci bacteriologically			Recovery
1902	Hunner & Harris (1)	10 yr.	Op. & autopsy	+			Death
1902	Hunner & Harris (2)	5½ yr.	Operation		+		Recovery
1918	Rivarola (1)	8 yr.	Operation	Proved gonococci bacteriologically			Recovery
1918	Rivarola (2)	8 yr.	Operation		+		Death
1926	Gleich	4 yr.	Autopsy		+		Death
1933	Author (1)	5 yr.	Autopsy			+	Death
1933	Author (2)	11 yr.	Operation			+	Recovery

When the diagnosis of gonorrheal peritonitis is made, the prognosis should be guarded. It is more serious when the diagnosis is proved at operation. In most instances, as reported in the literature, sterility has followed. Northrup, however, reported in 1919 that one of his patients had gone through a normal pregnancy and labor.

Treatment.—The treatment should be conservative. Absolute bed rest is essential. Most authors place the bed at an angle with the head of the bed raised, although whether this facilitates drainage is questionable. Symptomatic treatment should be instituted to combat vomiting, diarrhea, pain, and shock. When reasonable doubt of the diagnosis exists operation may be performed, but the surgeon should realize that the patient's chances of recovery, should the condition turn out to be gonorrheal peritonitis, is diminished.

Conclusions.—First, gonorrheal peritonitis is a serious and, fortunately, rare complication of vulvovaginitis. Second, the disease should be suspected when vulvovaginitis is complicated by signs of peritoneal inflammation. Third, absolute diagnosis is impossible without bacteriologic study of the peritoneal surface or exudate. Fourth, operation increases the mortality.

CASE REPORTS

CASE 1.—A. F., aged five years, was admitted to the Minneapolis General Hospital complaining of anorexia of two months' duration, and pain in the abdomen for one day. One week previous to admission, her parents had noticed that she had a vaginal discharge, and at that time had taken her to the out-patient department, where a diagnosis of gonorrheal vulvovaginitis had been made. She was treated for this condition during the week preceding hospitalization, with 10 per cent silver nitrate, applied to the cervix, and external douches of boric acid solution. The night before admission the patient began to have crampy pains in the lower left quadrant. At the time of admission the pain had become generalized. She had also vomited shortly before the onset of the pain, and this had recurred several times on the day of admission. The past history was essentially negative.

Examination.—The patient was a well-nourished and well-developed white female. The abdomen showed marked rigidity, with generalized and rebound tenderness, and was moderately distended. The rectal temperature was 101° F., pulse 120, and respirations 28. The leucocyte count was 58,000, and the differential count was 95 per cent polymorphonuclears, and 5 per cent lymphocytes.

Course.—On the evening of the day of admission a laparotomy was performed. Just at the end of the operation the patient began to show signs of respiratory and circulatory failure. She was given 1 c.c. of adrenalin intracardially and intramuscularly, and artificial respiration was maintained for one hour, but she could not be revived.

Operative Report.—Under ethylene anesthesia, the abdomen was opened, through a right rectus incision, and the bowel was packed off. After hunting some time for the appendix, a volvulus of the bowel was found, which was turned on the mesentery from left to right, throwing the ascending colon over to the left side of the abdominal cavity. The volvulus was reduced, and the appendix was found to be long and tortuous, but no more injected than the rest of the peritoneum. The bowel and the peritoneum were red and injected, and a few flakes of fibrin were found on the intestinal wall. No free pus was found. The appendix was not removed. Further exploration was directed toward the pelvis. Both tubes were found to be red, injected, and slightly swollen, with pus pouring from the fimbriated ends. The uterus was also found to be red and injected. A very slight amount of pus—perhaps 1 c.c.—was found in the culdesac. Smears were not taken because of the serious condition of the patient.

Autopsy Report.—The examination, limited to the abdominal organs, was performed by Dr. N. H. Lufken, pathologist at the Minneapolis General Hospital.

All peritoneal surfaces were deeply injected. This was more marked on the lateral surfaces of the parietal peritoneum, where the injection took the character of multiple aggregations of minute hemorrhages. No free pus was found in the abdominal cavity but between the coils of the intestines there were occasionally found deposits of yellowish fibrin. The intestines were moderately distended with gas. In the lower portion of the descending colon were a few subserosal hemorrhages. Other small hemorrhages were found beneath the mucosa of this area, and in two or three small places, areas of acute ulceration were found. This portion of

the bowel contained considerable bloody material. The uterus and adnexa were of the normal infantile type. The left fallopian tube was slightly swollen, and deeply injected, and upon pressure, yellowish pus issued from the fimbriated end. The right tube was somewhat less swollen than the left, but was essentially the same in appearance. Pus was also expressed from the fimbriated end of the right tube. The ovaries and uterus, except for the adjacent peritonitis, were normal. The vagina contained a considerable amount of pus. The bladder mucosa was smooth, and pale in color. The left ureter was normal in size, but on section a quantity of yellowish pus was found. No pus was found in the right ureter. The kidneys were slightly swollen and cloudy, but approximately normal in size and their pelves showed no inflammatory changes. The liver and spleen were not removed from the body; the liver was moderately swollen but did not show any specific changes. Smears taken from between the coils of the intestine, from both tubes, from the left ureter, and from the vagina showed pus cells with gram-negative intracellular diplococci.

CASE 2.—M. H., aged eleven years, was admitted to the Minneapolis General Hospital, complaining of "pain in her stomach" of twelve hours' duration. She had been having intermittent crampy pains in the abdomen just below the umbilicus for five days previous to admission. During that time she had had an occasional moderately sharp cramp-like pain in the abdomen. Also during this period she had had a moderately severe diarrhea—greenish watery stools—but no blood. Previous to the onset, the bowels had always been normal and regular. On the day before admission, shortly before noon, she came in from play complaining of pain in her stomach. After lying down for a short time she had an attack of vomiting. She then had repeated attacks, provoked by drinking water. The patient stayed in bed the rest of that day, enduring similar severe crampy pains. About 7 P.M. the pains stopped, and she slept for two hours; then suddenly at 9:30 P.M. she again vomited without having any abdominal pain. Shortly after this, the pains started again, and were intermittent in character, occurring about every two minutes. These pains were relieved when she assumed a sitting position, with her knees drawn up. The pain was worse when she would lie on the left side. The pains continued all night, and early the next morning a physician was called who diagnosed appendicitis, and advised hospitalization.

Family History.—The mother had contracted syphilis about four years previously and had been treated for two years. On careful further questioning it was found that the patient had been sleeping with a maid who had had gonorrhea for one and one-half years, and who at the present time is taking treatment for the disease.

Examination.—The patient was a well-developed, well-nourished white female. The abdomen showed a moderate rigidity, and rebound tenderness. This tenderness was perhaps slightly increased in the lower left quadrant. No masses were palpable. The genitalia externally were reddened, and a small amount of thick purulent discharge was visible. The blood examination showed the hemoglobin to be 92 per cent, erythrocytes, 4,470,000; leucocytes, 23,800; polymorphonuclears, 89 per cent; lymphocytes, 9 per cent; and monocytes, 2 per cent.

Course.—A vaginal smear taken on the day of admission contained gram-negative intracellular diplococci. She was operated upon the third day following admission, with a preoperative diagnosis of gonorrheal peritonitis, or possible acute appendicitis. A moderately injected appendix was found with some edema of the distal half, but no fibrin. A smear was taken of the small amount of peritoneal fluid present, in which gram-negative intracellular diplococci were found. The patient made an uneventful recovery from the laparotomy.

Additional Laboratory Data.—Vaginal smears showed gram-negative intracellular diplococci on seven successive occasions.

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THE LIMITATIONS OF CEREAL-MILK DIETS FOR HEMOGLOBIN FORMATION

C. A. Elvehjem, E. B. Hart, and W. C. Sherman
Madison, Wis.

THE problem of supplying foods which satisfy the requirements of rapid blood formation during infancy and early childhood is an exceedingly important one. The deficiency of milk, which is the chief food during a considerable period of rapid growth, in blood-forming elements (iron and copper) is a well-established fact. It is true that there is a storage of these elements in the newborn to counteract the deficiency of milk, but the supply varies with each infant and is exhausted very early in the nursing period. Since milk is deficient only in iron and copper as far as hemoglobin formation is concerned, it is important to know what foods will supply these elements to the best advantage.

In the past those foods showing the greatest total iron content were considered most valuable for the prevention of anemia. We now know that hemoglobin formation depends not only upon the amount of iron and copper present in the foods but also upon the availability of these elements. Recent studies[1] with rats have shown that organic iron (hematin) is much inferior to inorganic salts as a source of iron for hemoglobin formation. The work of Elvehjem and Sherman[2] which demonstrates that copper functions only in the utilization of iron after it is assimilated, clearly indicates the importance of supplying available forms of iron. The inactivity of hematin is due to the inability of the animal to assimilate the iron bound in this form.

Since some of the iron in all foods is present as hematin compounds, we were interested in the hemoglobin forming power of a few foods used in infant dietaries. With cereals, especially manufactured cereals, and milk constituting a large part of the growing child's diet, one can see the importance of an assay of commercially available breakfast foods in respect to their antianemic properties.

In this paper we will report the results obtained with the following well-known products: Ralston wheat cereal, Quaker rolled oats, Cream of Wheat, Wheaties, and Mead's cereal. The latter product is the only one which is claimed to be especially valuable for hemoglobin formation. Mead's cereal was devised in the Research Laboratories of the Hospital

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While our work was in progress Summerfeldt, Tisdall, and Brown[3] published a paper on the curative effects of cereals and biscuits on experimental anemia. They concluded that nutritional anemia of rats developed by an exclusive milk diet could be corrected when 33 to 50 per cent of the total diet (in calories) consisted of a special cereal or a special biscuit, while other cereal foods, such as Farina, oatmeal, Zwieback, arrow root, and whole wheat biscuits did not correct the anemia when fed in the same proportions. The special cereal used by them[4] consisted of 10 parts of yellow corn meal, 53 of wheat meal, 18 of oatmeal, 15 of wheat germ meal, 1 of alfalfa, 1 of yeast, 2 of bone meal, and is the basis for the manufacture of Mead's cereal. The special biscuit[5] was made of whole wheat flour, wheat germ (15 per cent), milk, bone meal (3 per cent), and iron. The complete percentage composition was not given.

Rose and Vahlteich,[6] and Rose and Kung[7] also have studied the effect of certain cereal products upon hemoglobin regeneration. However, these workers have emphasized the influence of factors other than copper and iron rather than the availability of these elements in the food. In the last paper Rose and Kung do mention a possible difference in the availability of the iron in liver and whole wheat.

EXPERIMENTAL

Rats were used for all the experimental work. They were made anemic according to the method of Elvehjem and Kemmerer.[8] When the animals were distinctly anemic (about 3 gm. of hemoglobin per 100 c.c. of blood) they were placed in individual cages and the cereals to be tested were added to the milk diet. Weighed amounts of the cereal were moistened with a small amount of milk and fed in the morning. The bulk of the milk was given in the afternoon. Daily consumption records were kept and the animals were weighed weekly. The hemoglobin values were determined each week by the Newcomer method with a standardized Bausch and Lomb filter and reported as grams per 100 c.c. of blood.

The cereal products were fed at several different levels, but the difficulty of complete consumption was encountered when quantities larger than 3 gm. were fed daily. The majority of the results recorded in this paper are those obtained when the 3 gm. level was used. The percentage of iron and copper and the amounts of these elements in the three-gram samples of each of the materials used are given in Table I. In addition to feeding the cereals alone, each product was fed when supplemented with iron alone and when supplemented with copper alone. One rat from each litter was given 0.5 mg. of iron, 0.05 mg. of copper, and 0.04 mg. of manganese, and served as the positive control.

TABLE I

IRON AND COPPER CONTENT OF CEREALS USED

	IRON		COPPER	
	PER CENT	MG. IN 3 GM.	PER CENT	MG. IN 3 GM.
Cream of Wheat	0.0015	0.045	0.0003	0.009
Quaker rolled oats	0.0069	0.207	0.0005	0.015
Mead's cereal	0.006	0.180	0.001	0.030
Ralston wheat cereal	0.005	0.150	0.0008	0.024
Wheaties	0.0095	0.285	0.00056	0.017

The manganese was added to allow optimum growth. At least six and in many cases eight to ten rats were used for each cereal and each supplemented cereal. Records are presented for only the first six weeks of the

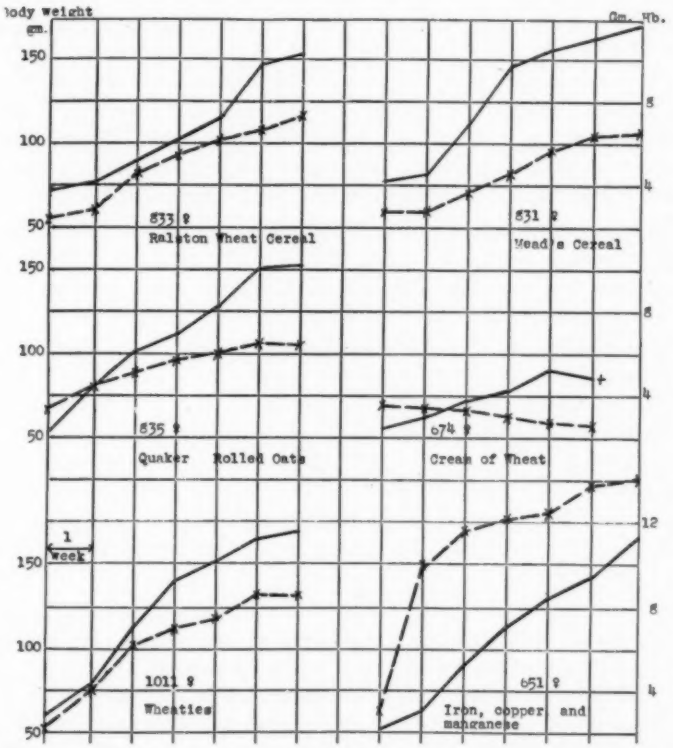

Chart 1.—Individual growth and hemoglobin records of rats given whole milk supplemented with 3 gm. of the different cereals or with 0.5 mg. Fe, 0.05 mg. Cu, and 0.04 mg. Mn. Each result is typical of the 6 to 8 animals on that particular diet. The solid line represents body weight and the broken line represents hemoglobin in grams per hundred cubic centimeters of blood.

experimental period, but many of the animals were continued for a much longer period. No significant changes were observed in any of the animals after the sixth week.

The growth curves and hemoglobin records for one rat on each of the cereal diets and one receiving the iron, copper, and manganese are given in Chart 1. The rat receiving milk plus Cream of Wheat grew very slowly, showed no increase in hemoglobin, and died during the fifth week of the experiment. Most of the animals on this product did not survive the six-week period. The failure of hemoglobin formation is to be expected, since 3 gm. of Cream of Wheat supplies less than 0.05 mg. of iron.

When 3 gm. of Ralston wheat cereal, Quaker rolled oats, Mead's cereal, or Wheaties were fed, good growth resulted in all cases. Some individual variation was observed, depending upon the ability of the animal to ingest all the cereal supplement during the first week of feeding, but the average growth records for each cereal are quite similar. Only female rats are included in Chart 1, and it is readily seen that all the rats except the one on Cream of Wheat grew to 150-175 gm. in six weeks. Similar though greater rates of growth were observed for the male rats. It is interesting to note that the rate of growth for the rats on the cereal supplements is not superior to that obtained when the milk is supplemented with iron, copper, and manganese.

The rate of hemoglobin formation in the rats on the cereal diets is much inferior to diets of mineralized milk. In practically every case the hemoglobin rose slowly to about 6 gm. and stayed between 6 and 7 gm. for many weeks. The rats receiving the Wheaties showed a slightly greater increase in hemoglobin because of a higher iron content. All these cereals supply about four times as much iron as Cream of Wheat, and 3 gm. furnish approximately 0.2 mg. Fe daily. This amount of iron does not allow optimum hemoglobin formation. None of the cereal preparations used in this study when fed at the 3 gm. level were able to supplement a milk diet sufficiently to allow hemoglobin regeneration comparable to that obtained with 0.5 mg. Fe and 0.05 mg. Cu. The results were no different when the cereals were cooked in distilled water before they were fed.

At first sight these results seem to be in complete agreement with the work of Rose and Vahlteich.[6] They found an average increase of 5.8 gm. hemoglobin in six weeks when 3 gm. of oatmeal were fed. However, the oatmeal used by them supplied only 0.096 mg. Fe, while the oatmeal used in our experiments furnished 0.207 mg. Fe. They state that 6 gm. of oatmeal or whole wheat flour, supplying 0.192 mg. of iron daily, brings about complete hemoglobin regeneration in six weeks. We have been unable to produce a normal hemoglobin level in our anemic rats by feeding any cereal which furnishes only 0.2 mg. Fe daily. The difference, we believe, is due to the fact that the rats used by Rose and Vahlteich were not depleted in iron reserves when started on the experiment. The hemoglobin was reduced to only 5-6 gm. per 100 c.c. of blood.

We wish to emphasize again the absolute necessity of depleting the animal of its reserve before the availability of iron compounds can be studied.

The results obtained when the cereals were supplemented with 0.05 mg. Cu daily are given in Chart 2. The rate of hemoglobin formation in the presence of the additional copper was slightly greater with all the cereals except Cream of Wheat, but the final hemoglobin level was not

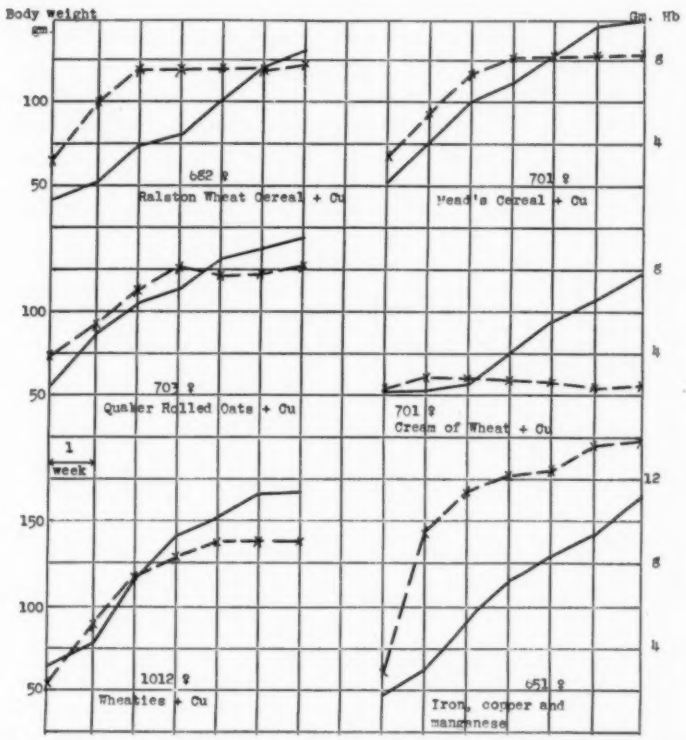

Chart 2.—Similar records when each cereal was supplemented with 0.05 mg. Cu, as $CuSO_4$, daily.

significantly larger than when the cereal was fed alone. The limited degree of hemoglobin formation on milk-cereal diets is therefore dependent upon a limited supply of iron rather than a deficiency of copper. Although no differences in growth were detectable, the animals receiving the additional copper seemed to be smoother and appeared to be in better physical condition. These animals had an exceptionally fine coat of hair. The rats receiving the Cream of Wheat grew better with the additional copper, although there was no detectable improvement in the blood stream.

When rats are given the same cereals supplemented with 0.5 mg. of iron daily, the results are entirely different. The growth curves and hemoglobin records for these animals are given in Chart 3. The rats on Ralston wheat cereal, Quaker rolled oats, Mead's cereal, and Cream of Wheat plus 0.5 mg. Fe showed a hemoglobin regeneration almost comparable to that obtained with iron, copper, and manganese. The Cream of Wheat, however, showed the slowest rate of hemoglobin regeneration with iron alone. These cereals supply sufficient copper for hemoglobin building, provided additional iron is fed, although when copper was fed in addition to the iron supplement, smoother and firmer animals were produced.

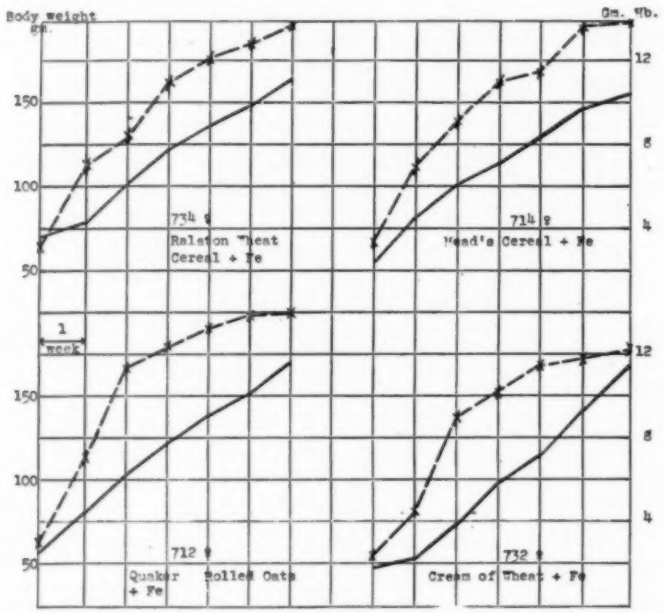

Chart 3.—Similar records when each cereal was supplemented with 0.5 mg. Fe, as $FeCl_3$, daily.

The hemoglobin records for the rats fed rolled oats with and without the iron and copper supplements are plotted in the same chart (Chart 4) in order to illustrate more completely the effect of these elements.

A complete tabulation of the consumption records is unnecessary, for the amount of milk consumed by the rats on the different diets was quite constant. The consumption of milk was rather low on all diets during the first week amounting to from 15 to 25 c.c. per rat per day. Thereafter the great majority of the rats consumed from 40 to 50 c.c. of milk daily. Those on the mineralized milk diet required a little larger quantity. The 40 c.c. of milk equivalent to 5 gm. of milk solids were furnishing, there-

fore, 60 to 65 per cent of the total solids or calories ingested. This ratio of milk to cereal is quite comparable to that found in most infant dietaries.

In the experiments which have been described no attempt was made to adjust the intake of the cereals according to their iron content, as all the products were fed at the same level. Further studies were made to determine the availability of the iron in the cereals. Rats were fed sufficient amounts of the different samples to supply 0.3 mg. Fe daily, and the results compared with those obtained when the iron was fed in the form of ferric chloride. All rats were given 0.05 mg. Cu to insure a sufficient quantity of this element. Three-tenths mg. Fe fed daily is not sufficient to allow an optimum rate of hemoglobin production, but the availability of the iron can be determined only when a subminimal amount is supplied. Only Ralston wheat cereal, rolled oats, and Wheaties were used in this test, because the amount of iron present in the other cereals was so low that the rats would not readily consume the quan-

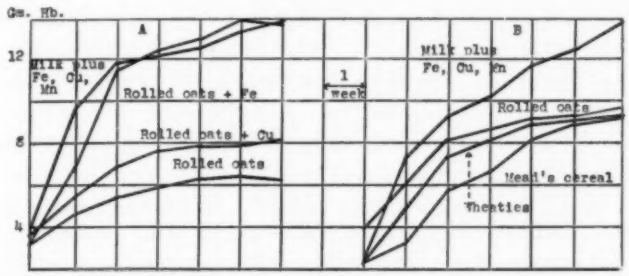

Chart 4.—*A*. Hemoglobin records of rats when the milk was supplemented with rolled oats alone, oats plus copper, oats plus iron, and iron, copper, and manganese.

B. Hemoglobin records of rats receiving 0.3 mg. of Fe in the form of ferric chloride, or 0.3 mg. of Fe supplied by Quaker rolled oats, Wheaties, and Mead's cereal, respectively. The cereals were fed at the following levels: rolled oats 4.4 gm., Wheaties 3.1 gm., and Mead's cereal 5.0 gm.

tities necessary. It is readily seen from the curves in Chart 4 that the iron supplied as ferric chloride is more efficient than that supplied by the cereals. The iron in Ralston wheat cereal and rolled oats is more available than the iron in Mead's cereal. Similar differences have been found for other food materials. Preliminary experiments with a chemical method for detecting nonhematin iron indicate that the availability of iron in foods is directly related to the amount of nonhematin iron present. These results will be published in a later paper.

DISCUSSION

These data indicate clearly that a whole milk-cereal diet is one inadequate in available iron, and to some extent in copper for rapid hemoglobin formation. The iron and copper requirements of the animals used in these experiments were exceedingly high because the reserves of the elements were depleted. The requirements for a normal

growing child naturally would not be so great, because the stores of the elements would have been conserved to a considerable extent. However, it is difficult to know when the demand for these elements exceeds the potential supply in the diet. The few figures available readily demonstrate that at least the iron content of most infant dietaries surely does not exceed, and in many cases does not meet the requirements.

The daily iron and copper intake for a 100-gram rat on a diet of 40 c.c. of 4 per cent milk and 3 gm. of oatmeal is approximately 0.28 mg. of iron and 0.021 mg. of copper. This diet would furnish approximately 40 calories. A child weighing 10 kilograms and requiring 900 calories per day would receive about 6.3 mg. of total iron and 0.47 mg. of copper, if milk and oatmeal were fed in the proportion given our experimental rats and in quantities sufficient to furnish 900 calories daily. For a child one and one-half years of age the daily iron intake, based on menus for that age formulated by Rose in *Feeding the Family*,[9] is approximately 7 mg. and the copper intake is 0.69 mg.[10] These figures are not greatly different from those of a diet of milk and oatmeal. Rose, Vahlteich, Robb, and Bloomfield[11] found the actual iron intake for a child used in a balance experiment to be 4.6 mg. This child was in a distinctly negative iron balance during the period of observation. It is difficult to believe that a daily intake of from 4 to 7 mg. of total iron will suffice over long periods of time.

It is true that many children escape nutritional anemia, but the hemoglobin titer in a large majority of our children is not as high as we often assume. Mackay[12] found in a large series of London infants at one year of age, definite anemia in 42 per cent of those that were breast fed and in 70 per cent of those artificially fed. Data collected at Madison, Wisconsin,[13] show that of the infants studied at one year of age, 10 per cent had hemoglobin values below 10 gm. per 100 c.c. and 38 per cent had values below 11 gm. The actual daily iron or copper requirement for a child of preschool age has not been definitely determined—if it ever can be. It has been placed at 8 mg. of iron per day. No figure for copper has been suggested. This amount of total iron per day may be entirely inadequate, as illustrated by a milk-cereal diet. The level of supply needed will depend upon many factors, including the form of iron in the food, the rate of absorption, intestinal conditions regulating absorption, change in constitution, etc. All the iron in foods is not available for hemoglobin building—part of it is in simple compounds which are the ones most likely to be available, and part of it is tied up in complex compounds from which it is not available.

Pediatricians prescribe the yolk of eggs as an anti-anemic food. The yolk of one egg contains but 1.2 mg. of iron. One-half cup of spinach (100 gm. fresh material) contains approximately 6.6 mg. of iron, but whether it is all or only partly available has not been determined. We

know that hemoglobin is readily built from inorganic iron in the presence of copper, but we know nothing about the form of the iron in many of our foods.

Mackay[12] has initiated in London the practice of reinforcing milk powder with an iron ammonium citrate for distribution to child centers. The iron ammonium citrate contains traces of copper but in nonstandardized amounts.

It would seem highly desirable that the milk-cereal diet of children should be constantly reinforced with those natural foods capable of augmenting the diet with readily available iron, or with readily available iron salts standardized to their copper content. What natural foods will increase the iron content of a milk-cereal diet sufficiently to insure liberal hemoglobin building have not as yet been determined. The hemoglobin level for best health also has not been fixed. Many children, no doubt, can live with a level of 9 to 10 gm. per 100 c.c. of blood, but would a level of 12 to 14 gm. be better?

This work does not in any way condemn the modern breakfast cereals. They are valuable sources for many of the essential nutrients, but it does point out their limitations in at least one respect.

SUMMARY

1. The following commercially prepared cereals: Ralston wheat cereal, Quaker rolled oats, Cream of Wheat, Mead's cereal, and Wheaties, have been studied for their hemoglobin-forming qualities when fed with whole milk to anemic rats. The cereals were fed at levels of 3 gm. per day and constituted approximately 40 per cent of the total caloric intake, which is quite comparable to the common practice in child nutrition.

2. The daily addition of 3 gm. of any of these cereals to the milk diet of anemic rats failed to induce normal hemoglobin formation. No hemoglobin production was observed in the case of Cream of Wheat, and the rate and degree of regeneration obtained with the other cereals was much inferior to that observed when the milk was supplemented with iron, copper, and manganese. Complete regeneration was never obtained with these cereal-milk diets, although the rats were continued on the diets from eight to ten weeks.

3. The addition of copper alone to the milk-cereal diets did not lead to appreciable increments in hemoglobin formation.

4. When the cereals were supplemented with iron alone, the hemoglobin regeneration was almost comparable to that obtained with mineralized milk. The addition of both iron and copper to the cereal products produced better appearing animals, although the hemoglobin formation was little improved over the addition of iron alone.

5. The iron in Quaker rolled oats, Mead's cereal, and Wheaties is not

as available for hemoglobin formation as the iron in ferric chloride. The iron in Mead's cereal is slightly less available than that in the rolled oats or Wheaties.

6. In view of these facts it is suggested that the milk-cereal diets of children be constantly reinforced with foods rich in available iron or with iron salts standardized as to their copper content.

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NEUTRALIZATION OF THE SCHICK REACTION BY HUMAN BLOOD

H. E. Thelander, M.D.
San Francisco, Calif.

IN A recent study of Schick materials two children with unexplained negative Schick reactions were found. The first of these was a baby one year of age, who without immunization, was repeatedly negative. The second was a child of eight years, who also without immunization changed from a Schick-positive to a Schick-negative reaction in the course of three months, and a year later was again Schick-positive. In reviewing these children's charts it was found that the first case had been transfused two weeks before the Schick test was applied. The donor for the transfusion was a hospital resident who was Schick-negative. This child retested Schick-negative until June, 1933, six months after the transfusion, at which time he was moderately positive. The second child who had been Schick-positive in November, 1931 had received 3 c.c. of chickenpox convalescent serum in December, 1931 and was Schick-negative two months later, in February, 1932. One year later, in February, 1933, he was again Schick-positive.

As a result of these observations Schick tests have been made before and after transfusions, and whenever possible, the donors have been tested for immunity. In addition to this, small quantities (4 to 6 c.c.) of blood have been given intramuscularly to determine the minimum amount which would neutralize the Schick reaction. Six Schick-positive persons have been given 4 to 6 c.c. of blood from a Schick-negative donor. Of these 6, 4 were Schick-negative by a test applied twenty-four hours after the injection. The other 2 patients, both of whom had markedly positive original reactions with sloughing of the area, had received only 4 to 5 c.c. of blood and upon being retested had slightly positive reactions. Later, one of these children was transfused, and a Schick test applied subsequent to transfusion was negative.

Of 7 children who were Schick-positive before transfusion, 4 were Schick-negative by a test applied twenty-four hours after the transfusion. Three of the 4 who gave negative Schick reactions received blood from donors who were Schick-negative or Kellogg "immune," but one received blood from a donor whose blood was reported "not immune" by the Kellogg test (antitoxin content of the blood).

The 3 children who were Schick-positive after transfusion gave reactions definitely smaller in size with less induration and staining than

From Children's Hospital, San Francisco.

previous to the injection of blood. The donors of 2 were Schick-positive or Kellogg "not immune," the third donor has not been satisfactorily checked.

The antitoxin content of the blood has been determined by a Kellogg test on all persons rendered Schick-negative by injections of blood. The test has been returned as "not immune" in spite of the negative Schick reactions in all but 2 cases. One case reported "immune" was in an adult who had been persistently Schick-positive and Kellogg "not immune" even after three series of immunization, two with toxin-antitoxin and one with toxoid. The last tests were made just prior to a 6 c.c. injection of whole blood. A Schick test applied twenty-four hours after the injection was Schick-negative. She has remained Schick-negative for four months and a Kellogg test taken four months after the injection was reported as "immune." The other person giving a Kellogg "immune" reaction had received two transfusions of 250 c.c. each.

The fact that as small an amount as 4 c.c. of blood will at times render the Schick test negative but not supply sufficient antitoxin to the blood stream to neutralize the toxin by the Kellogg test method is very interesting. The study will be continued along the following lines: (1) the antitoxin content of the donors will be determined; (2) the relationship of the blood groups and the sexes of the donor and recipient will be noted; (3) the effect of preservation and storage on the serum will be studied.

With the increasing interest in the use of convalescent and adult blood both prophylactically and therapeutically, this method offers an interesting lead in the study.

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384 Post Street

OBSERVATIONS ON THE MANAGEMENT AND TREATMENT OF JUVENILE DIABETES

GEORGE B. BADER
NEW YORK, N. Y.

OUR choice of diets in feeding diabetic children is as nearly similar to the diets fed normal children as possible. The generally accepted figures for the diets of normal children are roughly as follows: 12 to 15 per cent of the calories as protein, 30 to 35 per cent as fat, and 45 to 55 per cent as carbohydrate. An abundance of dairy products, green leafy vegetables, and fruit is essential in this diet and will meet the mineral requirements. Cod liver oil supplies the necessary vitamin D throughout the growth period.

Since, according to our present knowledge, diabetes mellitus is a disease in which there is failure on the part of the body to metabolize carbohydrate and since insulin given parenterally can entirely compensate for this inability, it seems logical to adopt these dietary standards in the treatment of the diabetic child.

The diet is high in carbohydate but low in fat as compared with the older and standard diets formerly employed in the treatment of juvenile diabetics. Specifically 2 to 3 grams of protein per kilogram of body weight are allowed unless the child is considerably underweight and undersized. The question of the amount of food in calories to be given to a particular diabetic child varies as in the normal child, according to its individual needs. In other words, one must be guided by the child's demands and by his response in growth and gain in weight. Roughly, therefore, the protein needs of the diabetic child are determined on the basis of what one considers normal weight for a nondiabetic child of a specific age. The amount of fat in grams should be approximately equal to that of the protein and the remainder of the total calories is furnished as carbohydrate.

We have divided the carbohydrate content of the diet as follows: $\frac{2}{5}$ for breakfast, $\frac{1}{5}$ for lunch, and $\frac{2}{5}$ for supper. This fractional distribution cannot remain absolute. For example, during the process of desugarization and stabilization, it often becomes necessary to transfer a few grams of carbohydrate from the breakfast to the lunch or do just the opposite, i.e., transfer a few grams of carbohydrate from the lunch to the breakfast. This is necessary in order to render the child sugar-free. Furthermore, a child occasionally has to have food between meals

From the Pediatric Departments of the Fifth Avenue and St. Vincent's Hospitals, New York City.

in order to prevent hypoglycemic reactions. There is often no other way of preventing these reactions except by giving this extra food at a specific time between meals. Where possible, however, we prefer not to give food between meals.

Such a plan as that described requires the administration of insulin at least twice daily. Although larger amounts of insulin are necessary in many children on this type of diet, the insulin can be made to accomplish more because more grams of carbohydrate are metabolized per unit of insulin on the higher carbohydrate, low fat diets. The omission of a dose of insulin is inexcusable and dangerous. The time we have chosen for the injections of insulin varies with the individual child. We usually give the insulin twenty to thirty minutes before breakfast and twenty to thirty minutes before supper. Occasionally, it is advantageous to lengthen this interval between the insulin and the meal to forty-five minutes or one hour. This is done by giving the insulin earlier. Sometimes it becomes necessary to administer a third dose of insulin at 1 or 2 A.M., in order to keep the patient sugar-free during the night. The extra dose is required if the disease is severe, or has lasted two or three years or more and has been poorly controlled. There is an economic advantage in the administration of 3 doses daily, because it reduces the total insulin required for twenty-four hours. It also reduces perceptibly the amount of insulin necessary per dose and thus reduces the likelihood and frequency as well as severity of insulin reactions.

Mothers should always be instructed to choose a different site for each insulin injection. Some readily absorbable form of carbohydrate food should always be available in the event of an insulin reaction during the interval between the administration of the insulin and the meal. This carbohydrate may be in the form of fruit which the child would ordinarily have at the meal. Of course, if this is done, it should be omitted from the meal. On the other hand, if he is given a carbohydrate which is not part of the meal the calorie equivalent of that carbohydrate must be deducted from the meal.

There are several reasons why the proportion of protein, fat, and carbohydrate suggested is advantageous for the diabetic child:

1. It gives the child a well-balanced diet, one easily adapted to his needs, and easily adapted to his tastes.

2. It does not differ from the diet of his brothers and sisters.

3. In diabetes mellitus in children, where the condition is apt to be uncontrolled for one reason or another, the excess carbohydrate by providing more to be burned, lessens the danger of acidosis and coma so common in juvenile diabetics.

4. A generous allowance of carbohydrate may be an important factor in the few insulin reactions. In this connection it is significant that C. F. Cori[1] has shown there is more prolonged absorption of carbohydrate from the intestinal tract when larger amounts are given.

5. There is considerable evidence suggesting that fat depresses insulin efficiency, hence low fat is desirable.[2]

6. The children are satisfied and are not tempted to steal food.

Having established the diagnosis of diabetes mellitus, the child is admitted to the hospital. The blood chemistry and urine analysis are done at once during which time the diet is computed. The total available carbohydrate is determined and this is divided by 5 to obtain the total insulin dosage, thus allowing one unit of insulin for each 5 grams of total available carbohydrate in the diet. Since two doses of insulin are given in twenty-four hours, one before breakfast and one before supper, and since the breakfast insulin must cover the lunch as well, the diet being divided $\frac{2}{5}$ for breakfast, $\frac{1}{5}$ for lunch, and $\frac{2}{5}$ for supper, $\frac{3}{5}$ of the total insulin is given as the breakfast dose and $\frac{2}{5}$ as the supper dose. We have found this to be a safe insulin dosage with which to start. Our patients have never been rendered sugar-free until the insulin was increased considerably beyond this theoretical amount, i.e., one unit of insulin for each 5 grams of total available carbohydrate in the diet.

The twenty-four-hour urine is collected in 3 separate specimens divided as follows:

1. Breakfast insulin to the lunch
2. Lunch to the supper insulin
3. Supper insulin to the breakfast insulin

These specimens furnish the guide for future insulin dosage. They give the indication for a rearrangement of the carbohydrates in the breakfast and the lunch, for the giving of carbohydrate between meals, and finally for the administration of the small extra dosage of insulin during the night when the night specimen cannot otherwise be rendered sugar-free.

At this point, we should like to note a warning about the interpretation of the Benedict test. Patients will occasionally misinterpret the green precipitate of urates for glucose. We have seen insulin increased far beyond the necessary amount due to a false interpretation of such a precipitate. If the sediment in the specimen is not orange, the urine may be considered to be sugar-free.

Having established the amount of insulin and the manner in which it is divided into the two daily doses, the desugarizing process is conducted as follows:

The insulin is increased 2 units per dose per day until:

(a) the urine specimen from the breakfast insulin to the lunch is sugar-free or,

(b) the urine specimen from the lunch to the supper insulin is sugar-free or,

(c) the urine specimen from the supper insulin to the breakfast insulin is sugar-free.

The urine specimen which is usually the first to become sugar-free is the specimen from the supper insulin to the breakfast insulin. When this occurs, the supper dose of insulin is decreased 5 units daily until sugar reappears in the urine specimen from the supper insulin to the breakfast insulin. When this happens, the supper dose of insulin is increased 2 units daily until the specimen from the supper insulin to the breakfast insulin is again sugar-free. Thereupon, the supper dose of insulin is again decreased 5 units daily until sugar reappears in the urine specimen controlled by this supper dose of insulin. The supper dose of insulin is again increased 2 units daily until the specimen is again sugar-free. By seesawing in this manner, one eventually arrives at a basal dosage of insulin with which the urine specimen in question (from the supper insulin to the breakfast insulin) is kept sugar-free.

Very much the same procedure is followed for the breakfast insulin except that this dose of insulin must control 2 urine specimens, namely:

(a) the breakfast insulin to the lunch
(b) the lunch to the supper insulin

The urine specimen from the lunch to the supper insulin invariably becomes sugar-free first. When this occurs and the urine specimen from the breakfast insulin to the lunch contains sugar, the breakfast insulin dose is not altered until an adjustment is made in the carbohydrates for breakfast and lunch. Under the circumstances mentioned, 5 grams of carbohydrate are removed from the breakfast and added to the lunch. This transfer of carbohydrates from the breakfast to the lunch is increased 5 grams daily until both urine specimens (breakfast insulin to the lunch and lunch to the supper insulin) show sugar or are sugar-free. If both of these specimens show sugar, the breakfast dose of insulin is increased 2 units daily until they become sugar-free. When they become sugar-free, the breakfast insulin is decreased 5 units daily just as the supper dose of insulin was decreased 5 units daily until sugar reappears in one or other or both specimens of urine which the breakfast dose of insulin controls. If the lunch to supper insulin specimen shows sugar first and the breakfast insulin to lunch specimen is sugar-free, the breakfast insulin dosage should remain unchanged until an adjustment is made in the carbohydrate of the breakfast and the lunch. This is accomplished by transferring 5 grams of the carbohydrate from the lunch to the breakfast, increasing the amount transferred in this manner 5 grams daily until the two urine specimens are sugar-free or until both show sugar. If both urine specimens show sugar, the breakfast dose of insulin is increased 2 units daily until both urine specimens are sugar-free. When they are sugar-free, the breakfast dose of insulin is decreased 5 units daily until sugar reappears. The procedure is exactly analogous to the manipulation of the supper insulin dosage except that the dietary adjustments are necessary with the

breakfast insulin dosage, because the breakfast insulin controls the carbohydrate metabolism in two meals, the breakfast and the lunch.

One must not completely abolish a dose of insulin. When the insulin dosage has been reduced to 8 or 10 units, one should make less than 5 unit decreases. Three or 2 or even 1 unit decreases would be indicated at this point.

In order to facilitate a better understanding of the process of desugarization and stabilization, the following practical illustration of a patient is presented.

CASE 1.—Female, aged seven years, weight 21 kg., height 125 cm. The normal weight for this child is 23 kg. Allowing 2½ grams of protein per kg., 23 × 2½ = 57½ grams, the protein requirement. For the sake of simplicity, we choose the nearest multiple of 10 which is 60, so that:

Protein = 60 grams.

Allowing a similar amount of fat:

Fat = 60 grams.

The total calories required for a girl of seven years = 76 per kg., 23 kg. × 76 cal. = 1,748 calories = total calories required.

The total calories – (protein + fat calories) = carbohydrate calories.

Protein = 60 grams × 4 = 240 calories as protein
Fat = 60 grams × 9 = 540 calories as fat

Protein + fat calories = 780 calories

Total calories required 1,748 – (protein + fat calories) 780 = 968 calories to be furnished as carbohydrate.

968 ÷ 4 = 242 grams = carbohydrate grams.

For the sake of simplicity, we choose again, the nearest multiple of 10 which in this instance is 240.

The diet is therefore:

Carbohydrate	240 grams
Protein	60 grams
Fat	60 grams

This diet is divided ⅖ for breakfast, ⅕ for lunch, and ⅖ for supper, as follows:

	CARBOHYDRATE (grams)	PROTEIN (grams)	FAT (grams)
Breakfast	96	24	24
Lunch	48	12	12
Supper	96	24	24

In order to determine the total insulin, the total available carbohydrate in the diet must be computed:

The diet contains 240 grams of carbohydrate as carbohydrate — = 240 grams
58 per cent of the protein is available as carbohydrate, 60 × 58 per cent — = 34.8 "
10 per cent of the fat is available as carbohydrate, 60 × 10 per cent — = 6.0 "
The total available carbohydrate in the diet — = 280.8 "

Allowing one unit of insulin for each 5 grams of total available carbohydrate in the diet:

280.8 ÷ 5 = 56+, or 57 units of insulin are required.
⅗ of this insulin is to be given as the breakfast dose = 34 units.
⅖ is to be given as the supper dose = 23 units.

Further insulin and dietary adjustments are indicated graphically in Table I:

TABLE I

INSULIN AND DIETARY ADJUSTMENTS

DAY	WT.	INSULIN	URINE ANALYSES								
			BKFST. INS. TO LUNCH BREAKFAST			LUNCH TO SUPPER INS. LUNCH			SUPPER TO BKFST. INS. SUPPER		
			SUGAR	ACETONE	DIAC.	SUGAR	ACETONE	DIAC.	SUGAR	ACETONE	DIAC.
1	46	34-0-23	++++	++++	++++	++++	++++	++++	++++	++++	++++
2		36-0-25	++++	++++	++	++++	++	0	+++	0	0
3		38-0-27	++++	0	0	++++	0	0	++	0	0
4	50	40-0-29	++++	0	0	++	0	0	0	0	0
5		42†-0-24	++++	0	0	0	0	0	0	0	0
6		42†-0-19	++	0	0	0	0	0	+++	0	0
7		42-0-21	0	0	0	0	0	0	0	0	0
8		37-0-16	0	0	0	0	0	0	0	0	0
9		32‡-0-11	0	0	0	++	0	0	+++	0	0
10		32-0-13	0	0	0	0	0	0	0	0	0
11		27*-0-8	+	0	0	+	0	0	++	0	0
12		27-0-10	0	0	0	0	0	0	0	0	0
13		22-0-8	0	0	0	0	0	0	0	0	0
14		17†-0-6*	+++	0	0	0	0	0	+	0	0
15		17-0-6	0	0	0	0	0	0	0	0	0
16		12†-0-5	++	0	0	0	0	0	0	0	0
17		12-0-4	0	0	0	0	0	0	++++	0	0
18		10-0-6	0	0	0	0	0	0	0	0	0
19		8-0-5	+++	0	0	++	0	0	+	0	0
20		10-0-7	0	0	0	0	0	0	0	0	0
21		8*-0-5	+	0	0	+	0	0	0	0	0
22		8-0-4	0	0	0	0	0	0	++	0	0
23		6-0-6	+++	0	0	++	0	0	0	0	0
24		8-0-6	0	0	0	0	0	0	0	0	0
25		6-0-4	+	0	0	+	0	0	0	0	0
26	52	7-0-4	0	0	0	0	0	0	0	0	0

*Insulin remains unchanged because of the small amount of sugar.

†Insulin is unchanged but 5 grams of carbohydrate is transferred from the breakfast to lunch.

‡Insulin remains unchanged but 5 grams of carbohydrate is transferred from lunch to the breakfast.

Note the gain of 4 pounds in the first four days of insulin therapy and 6 pounds in the first twenty-six days.

The final distribution of the carbohydrate in the diet when the patient is stabilized and the dietary adjustments have been made as represented graphically in Table I is:

	CARBOHYDRATE (grams)	PROTEIN (grams)	FAT (grams)
Breakfast	81	24	24
Lunch	63	12	12
Supper	96	24	24

The basal insulin dosage is 7 units thirty minutes before breakfast and 4 units thirty minutes before supper.

It requires from two to four weeks before the child is finally stabilized. It has been our custom to keep these children in the hospital for most of this period as ambulant patients. This, we believe, has much to recommend it. The parents are given an opportunity to learn the preparation of the diet, weighing, manipulation, substitutions, etc. They learn the technic of insulin administration, and they are taught the simple urinary tests they must know, the test for glucose, acetone, and diacetic acid.

The tolerance during the early months of diabetes and frequently throughout the first year of the disease is very great. In fact, so small are the doses of insulin required when patients leave the hospital that it appears at times the insulin could be abolished, but the reduction by only a single unit will promptly cause glycosuria to recur. After the earlier months, the sugar tolerance gradually diminishes, necessitating an increase in the insulin even while the diet remains constant.

In order to illustrate this early loss of tolerance, Table II is typical.

Loss of tolerance may be the first evidence of acute illness and may appear from twenty-four to forty-eight hours before any other clinical manifestation. We shall not touch upon illness in the diabetic child because illness of any degree of gravity requires the services of an expert and the sick diabetic patient should be hospitalized.

Insulin reactions in our carefully controlled juvenile diabetic patients are the exception rather than the rule. We have some controlled patients who have had no more than two or three reactions in as many years. Reactions, in general, are decidedly less common in the first year of the disease. The most common times for the occurrence of insulin reactions on the regime described are from eleven to twelve in the morning, four to five in the afternoon, and ten to eleven at night. The afternoon reactions usually occur after school hours and are associated with vigorous exercise, such as football. Some mothers, recognizing this, will give a little extra carbohydrate after school but not enough to produce glycosuria.

In order to achieve any degree of success in the control of a juvenile diabetic, it is necessary to adhere to a fairly definite routine. This

TABLE II

CASE 1

AGE YEARS	WT.	HT.	DIET C P F	INSULIN B S
7	46	50	240 -60-60	34-0-23*
–	52	50	240 -60-60	7-0- 4†
7 9/12	59	52	270‡-70-70	16-0-10
8	63	52½	270 -70-70	18-0-10§
8 9/12	74	54	270 -70-70	30-0-28**
9	72½	55	270 -70-70	28-0-26
9 9/12	75½	55¾	270 -70-70	24-0-20
10	78	56	300 -70-70	20-0-20
10 9/12	80½	58½	300 -70-70	23-0-21**
		CASE 2		
5 9/12	36	42	200 -50-50	28-0-19*
–	40	42	200 -50-50	10-0- 7†
6	41	43	210‡-60-60	13-0- 9
6 9/12	44½	44	210 -60-60	18-0-11
6 9/12	46¾	44¾	220‡-60-60	16-0-12§
7	48¾	45½	220 -60-68	21-0-18**
7 9/12	50½	46¾	240‡-60-68	22-0-18
7 9/12	53½	47½	240 -60-68	21-0-17
8	55¼	48¼	260‡-70-70	20-0-15
8 9/12	62	50	280‡-70-70	25-0-20
9	63¼	50½	280 -70-70	22-0-16**

*The initial insulin when the process of desugarizing is begun.

†Basal insulin dosage for Case 1, 7-0-4 at end of twenty-six days; for Case 2, 10-0-7 at end of sixteen days.

‡Note increase in diet due to gain and requirement for more food.

§Note loss in tolerance during the first year and later fluctuations, loss and gain in tolerance with diet a constant.

**Note in Case 1 improvement in carbohydrate tolerance after eighteen months of diabetes. Less insulin is required for a diet of 300-70-70 than for a diet of 270-70-70. Note in Case 2 a similar gain in tolerance. No increase in insulin is necessary even when the diet is increased from 200-60-68 to 280-70-70.

To be noted also is the gain in weight and height as an index of healthy progress.

includes exercise, rest, and a regular time for meals. The exercise should be regulated as much as possible, because exercise within reasonable limits will increase the tolerance for carbohydrate; whereas, overexercise to the point of fatigue will diminish tolerance. The regulation of a child's exercise is not easy. The days of greatest difficulty during the school year are Saturdays and Sundays. On such days, mothers have learned from experience how much less insulin they can give in order to avoid an insulin reaction, or they give a little extra carbohydrate, such as fruit, at the times of day when experience has taught them to anticipate a reaction. The insulin requirements during vacation time, especially in the summer months, are appreciably less than during the school year. Reactions at night have been uncommon. They may be associated with fear on the part of mothers of a reaction in sleep so that the supper dose of insulin is often insufficient to keep the child sugar-free. We have often observed that a child whose urine is sugar-free at night will pass urine containing sugar before the breakfast insulin is given. This happens in children who have severe diabetes or in whom the diabetes is of long standing. The phenomenon is explained

by the fact that the action of insulin disappears after about eight hours and consequently the blood sugar begins to rise in the early morning hours and will rise above the spilling point if not enough insulin was given for supper. In instances where it is not possible to give enough insulin at the supper dose without producing an insulin reaction at 10 or 11 P.M., it is our custom to introduce a third smaller dose of insulin at 1 or 2 A.M. or at 4 or 5 A.M. and give less than usual for the supper dose. Not only will this keep the night specimen sugar-free but also has an effect on the amount of insulin necessary at breakfast as well. It makes it easier to keep the breakfast to lunch specimen sugar-free, the specimen which in our experience has been most difficult to control.

The best results are achieved through intelligent, conscientious and cooperative parents and nurses. Insulin reactions are unusual under such circumstances and sugar-free or nearly sugar-free specimens have been the rule. Parents tell us they are able to detect from the child's disposition whether or not the child is sugar-free. Almost invariably they notice that the disposition is at its best when the child is kept just sugar-free or showing only slight traces of sugar. They also notice that when the child shows much sugar, without acetone and diacetic acid in the urine, the child is sullen, wants to be by himself, does not want to be disturbed, is inactive, sluggish, lazy and has no appetite, whereas, when the insulin is more than necessary to keep him just sugar-free, he is irritable, snappy, impulsive, full of activity, and hungry.

It is important to keep the diabetic child happy. Not only must he have the appearance of well being but he must have a sense of well being. He should be permitted and encouraged to do the things that normal children do and every effort must be made to prevent him from developing a feeling of inferiority. He should be taught early the ABC'S of diabetes mellitus and should be made self-reliant when this is possible. Mentally, as well as physically, these children are, in our experience, precocious. They make excellent progress at school and their physiques are usually splendid. They now grow and develop as normal children do. Although we feel that the high carbohydrate, low fat diet is important, we desire to emphasize the necessity of proper diabetic control because it is the uncontrolled diabetic child who does badly.

RÉSUMÉ

Our choice of diets in feeding diabetic children are those which are as nearly similar to the diets fed normal children as possible. They are high in carbohydrates and low in fats. Two to 3 grams of protein per kilogram of body weight are allowed unless the child is considerably underweight and undersized. An equal number of fat grams is given. The balance of the total calories required is furnished as carbohydrates. The question of the amount of food in calories to be given to a particular dia-

betic child varies as in the normal child according to its individual needs. One must be guided by the child's response in growth and gain in weight. The advantages of such a diet are described.

At least two daily doses of insulin are required, one before breakfast, the other before supper. Sometimes three daily doses of insulin are advantageous. A third dose of insulin has an economic advantage, because it reduces the total insulin required for twenty-four hours. It also reduces perceptibly the amount of insulin necessary per dose and thus reduces the likelihood and frequency, as well as the severity, of insulin reactions.

A detailed account is given of a diabetic child on such a regime as that described. It includes a method of computing the diet and the insulin; the manner of dividing the diet and the insulin; a technic for desugarizing and stabilizing; and, finally, subsequent care.

The importance of proper diabetic control is emphasized because it is the uncontrolled diabetic child who does badly.

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103 EAST SEVENTY-FIFTH STREET

THE DETERMINATION AND EVALUATION OF DIETS IN CHILDREN WITH CHRONIC HEART DISEASE

MARTIN M. MALINER, M.D., BROOKLYN, N. Y.
BEATRICE BERGMAN, M.D., NEW YORK, N. Y.

THE question of what to feed the child is forced upon every physician in the care of children with heart disease. Many dietaries are based on theoretical considerations or on the physician's own personal experience. Mackenzie[1] said "Considering that our knowledge of the factors concerned in digestion and metabolism are still more or less hazy, we should be hesitant of basing our practice on any special dietary."

In the consideration of the treatment of heart disease in the past, the importance of diet has been more or less recognized but relegated to the background. It is interesting to note that Corvisart[2] in 1812, divided the treatment of heart disease into three stages, but gave only one line to diet: "Food should be light and taken in small quantities." Bertin[3] in 1833, suggested "A rather strict diet." Blakiston[4] in 1865, considered it advisable not to fill the stomach at one meal, but to order small meals of nutritious food at frequent intervals. The finest ideas were propounded by that old master, Austin Flint[5] in 1859. He said, "The diet suited to obviate a tendency to weakness is that best adapted to healthy nutrition. Healthy nutrition and thereby the muscular vigor of the heart requires blood, rich in nutritive materials. Diet should embrace a fair proportion of animal food, liquids sparingly, so as not to increase the quantity of blood. Articles of food should be adapted to the digestive powers. Action of the heart is liable to be disturbed through its sympathetic connection with the stomach." Broadbent[6] and later Brockbank[7] suggested a liberal and varied diet, with avoidance of excess. Neuhof[8] very nicely suggests to remember that we are dealing with a chronic condition, and that the dietetic regimen will have to be carried out for months and even years. Hence the diet should not be unnecessarily harsh or restricted, and consideration should be given as far as possible to personal idiosyncrasies and tastes. Vaquez and Laidlaw[9] have attempted to make the most thorough analyses of the various components of diets in order to determine the possible insults and benefits derived. They especially discuss meats, calcium, sodium chloride, albuminoids, liquids, and the fruit diet. The conclusions are more or less indefinite. They do, however, suggest a low protein and a high fruit diet as being of distinct value. Gauss[10] also warns against

From the Out-Patient Department of Children's Cardiac Clinic of the New York Post-Graduate Hospital and Medical School of Columbia University, New York.

a high protein diet. Practically all investigators[10, 11, 12, 13] insist on a restriction of fluids in all cases except in the well-compensated ones.

In recent years, the question of nutrition and diet has come to the foreground. In fact the pendulum has perhaps swung too far in the opposite direction, and all diseases are being treated more or less specifically by diet. In many chronic ailments some of these dietaries have proved to be of unusual value, whereas other diets are not only worthless, but often misleading. In heart disease an abundant fruit and vegetable diet has been suggested by Epstein.[14] He claims that the salicylic and benzoic acids in these foods serve as prophylactic and therapeutic agents in rheumatic heart disease of children. Epstein himself is vague about the correctness of these statements. The scientific laboratory of the California Packing Corporation[15] after a thorough research presents the following facts: "Very few fruits or vegetables contain benzoic or salicylic acids or their salts. The notable exception to this is cranberries which are rather high at times in benzoates. Strawberries at times have a substance very much akin to salicylic acid, give a similar purple reaction with ferric chloride. The acids in the rest of the fruits, including tomatoes, is malic or citric, or a mixture of the two, while the acid of apples is entirely malic." Surmont[16] presents the fruit diet from a different viewpoint. He shows that this diet acts as a dechloridant, laxative, and diuretic. It also possesses an alkalinizing action which is very useful in many patients.

Hyman and Protas[17] have prescribed a series of high carbohydrate and low fat diets for heart disease, in which artichokes assume a very important rôle. They explain, "There is no substitute for artichokes which contain a substance called inulin that is a direct food for the heart muscle." Root and Baker[18] report that inulin is a substance resembling starch in its physical properties, and is found in the tubers of the dahlia, elecampane, and artichoke. However, it gives rise to marked gaseous formation in the intestinal tract and therefore is of very little practical use.

Most men stress the importance of the relationship of the gastrointestinal tract to cardiac disturbances. Carter, Howe, and Mason,[19] also Sutherland[20] mention the production of cardiac reflex disturbances through the vagus nerve due to gastrointestinal disturbances. Sutherland even goes so far as to declare that, "More patients come to a doctor complaining of heart trouble when the digestion is at fault, than do those whose hearts are actually diseased." Friedenwald and Rurhah,[21] Lombard,[22] Schmidt,[23] Lutembacker,[24] Darnall,[25] and Brockbank all agree that large meals produce a residue of undigested food in the stomach and intestines producing fermentation and gaseous distention, with consequent disturbances of cardiac function.

Most men agree on the dietetic treatment of the advanced cases of heart failure, particularly when extensive edema is present. This is

usually in the form of a Karell diet with its low fluid and low caloric content. No definite dietary regimen has been presented for the ambulatory type of heart disease in children. In a recent monograph, Smith and Sutton[26] discuss the treatment of heart disease in infancy and childhood, but they neglect to mention anything definite about diet. They do however suggest, "A carefully planned daily regimen and diet should be given every parent at the beginning of treatment."

We shall endeavor to present the carefully planned diet. In attempting to evaluate the importance of a special dietary in children with chronic heart disease, we have investigated the efforts of others, and based on these together with our own experiences, have devised a plan for the dietary treatment of these children. To begin with, we must be cognizant of the fact that we are dealing with children, human beings in the period of greatest growth and development. It is not sufficient to invoke a basic maintenance diet, we must remember that storage in growth is only possible when the basal energy requirement and the additional calories for activity have been met. In considering the diet of the child we must therefore consider (1) the basal metabolism, (2) the metabolism due to activity, and (3) the storage of material in growth. According to Du Bois it seems that there is nothing in heart disease of itself that alters the metabolism, especially the ambulatory type. Sherman,[27] Du Bois, Talbot,[28] Rose,[29] Gillett[30] and Harrop[31] concur in the fact that the child requires approximately twice as many calories per kilogram of body weight as an adult.

TABLE I

TOTAL CALORIES FOR CHILDREN IN TERMS OF BODY WEIGHT

AGE IN YEARS	CALORIES PER KG.	CALORIES PER LB.
2- 5	90 -- 80	40 -- 36
6- 9	80 -- 70	36 -- 32
10-13	75 -- 65	34 -- 30

A five-year-old child requires 80 calories per kilogram, an adult 40 per kilogram. We here present the total caloric requirements for children between the ages of two and thirteen years. (Table I.)

The average diet, of course, must contain the proper proportions of fat, protein, and carbohydrate, together with the necessary minerals and vitamins. As Einhorn[32] says, "In chronic conditions an adequate diet must be given containing food material of all three nutritive groups; protein, carbohydrate, and fat in sufficient quantity to protect the organism from any loss of its tissue." For the growing child the protein requirement varies with the rate of growth, being highest in infancy and gradually falling. A diet containing approximately 10 to 15 per cent of the calories in protein is probably correct. Ordinarily about 50 per cent of the calories should be derived from the carbohydrates and

TABLE II

DIET 1. AVERAGE DAILY MENU FOR CLASS I. (AGE SIX TO NINE YEARS.)

Breakfast:

Fruit: Orange, grapefruit, tomato juice, stewed prunes, apple sauce, raw apple, etc.

Cereals: (Preferably cooked, dry occasionally.) Oatmeal, Cream of Wheat, Farina, Pettijohn, Wheatena, Ralston, etc.

Toast and butter.

Egg may be included here if not given at supper.

Milk or coca to drink.

	SERVING	WEIGHT (GM.)	PROTEIN (GM.)	FAT (GM.)	CARBO-HYDRATE (GM.)	CAL-ORIES
Orange	average size	245	1.50	0.25	21.20	90
Farina	2 tbsp.	100	1.65	1.21	11.45	56
Whole wheat toast	1 slice	40	4.0	0.4	20.9	107
Butter	½ ball	7.5	0.05	6.3	0.0	50
Milk	glass	220 c.c.	7.3	8.8	11.0	157
Total			14.50	16.96	64.55	460

Dinner or Supper:

1. Meat (never fried): Lamb chop, broiled steak, chicken, liver, roast beef, or fish.
2. Vegetables: Baked or boiled potato, rice or macaroni, spinach, asparagus, green peas, string beans, carrots, celery, etc.
3. Desserts: Rice pudding, bread pudding, Junket, custard, stewed prunes, baked apple, apple sauce, tapioca, corn starch, ice cream.
4. Milk, bread and butter.

	SERVING	WEIGHT (GM.)	PROTEIN (GM.)	FAT (GM.)	CARBO-HYDRATE (GM.)	CAL-ORIES
Lamb chop	2 small	60	11.3	17.2	0.0	200
Baked potato	1 medium	120	2.64	1.0	22.0	100
String beans	½ cup	96	2.2	0.28	7.1	40
Whole wheat bread	1 slice	40	3.88	0.36	19.8	98
Milk	½ glass	110 c.c.	3.66	4.4	5.5	78
Butter	½ ball	7.5	0.05	6.3	0.0	50
Stewed prunes	2 tbsp.	80	0.5	0.5	24.5	100
Total			24.23	30.04	78.9	666
Midafternoon (or after school):						
Milk	glass	220 c.c	7.3	8.8	11.0	157

Supper:

Cream soup: tomato, celery, asparagus, etc.

Salad: lettuce, tomato, apple, celery, grated carrot and cheese, etc.

or

Egg if not eaten at breakfast.

or

Cereal (occasionally).

Vegetables (as for luncheon), or macaroni baked with cheese.

Milk, bread, butter.

Simple dessert as above.

TABLE II—CONT'D

	SERVING	WEIGHT (GM.)	PROTEIN (GM.)	FAT (GM.)	CARBOHYDRATE (GM.)	CALORIES
Macaroni baked with	¾ cup	163	3.75	0.0	12.9	61
Amer. cheese	1" cube	16	4.34	5.34	0.34	67
Sliced tomato	med. size	100	1.20	0.2	4.00	23
Milk	glass	200 c.c.	7.32	8.8	11.0	156
Bread	1 slice	42	4.0	0.4	20.9	101
Butter	½ ball	7.5	0.05	6.3	0.0	50
Pineapple (canned)	1 large slice	65	0.3	0.4	23.7	100
Total			20.96	21.44	72.84	558

Total for Day:

Protein 66.99 grams; Fat 77.24 grams; Carbohydrate 227.29 grams; Calories 1,841.

Protein 14.7%; Fat 37.7%; Carbohydrate 47.6%.

35 per cent from fat. A child should have one full gram of calcium a day in conjunction with one gram of phosphorous. Iron is best utilized in the presence of minute amounts of copper, about 0.015 gram per day. Other minerals in the diet will be small amounts of iodine, sulphur, sodium, potassium, and magnesium. These minerals are important because: (1) the minerals influence the contractility of the muscles, (2) they influence the irritability of the nerves, (3) they control the movements of liquids in the body (osmosis), (4) assist in coagulation of the blood (calcium), (5) aid digestion by favoring alkalinity and acidity, and (6) maintain blood neutrality. Lorand[33] mentions the absolute necessity of vitamins in the food for the activity of the myocardium. The vitamins A, B, C, and D, all appear to bear a relation to resistance to infection. It is not easy to secure evidence of direct bactericidal action of vitamin A, but Mendel[34] feels certain it holds an indefinite function in preserving health and vigor. Vitamin B[35] deficiency may present functional disorders of the heart. Vitamin C[36] offers resistance to infections. Vitamin D[37] stimulates increased amounts of calcium and phosphorous in the body.

We have presented the basic requirements of the normal child, as we feel that the diet of the cardiac child must by all means include these recognized factors.

Our cases have been divided into three clinical classes according to their functional capacity, as suggested by the New York Heart Association.[38] First, those patients able to carry on all the normal activities of life, Class I. Second, Classes II-A and II-B, those patients whose activities are moderately or greatly curtailed. Third, Class III, those children who are bedridden or completely decompensated. The first class assimilates and metabolizes the same as the normal child. So we present the average normal diet for the six-to-nine-year-old child. Necessary modifications are, of course, to be considered for the underweight and overweight child.

The diet for Classes II-A and II-B presents a few changes. The heart

in these children is more or less embarrassed by a weakened and hypertrophied myocardium. The blood pressure is often elevated. There is a tendency to cyanosis and dyspnea upon exertion. Frequently, the kidneys are unable to cope completely with the disturbed circulation, and there is a hepatic insufficiency.[40] In these cases we use a diet with a decreased quantity of protein, less fluid, less salt, and decreased amounts of purines, such as liver, sweetbreads, etc. In this group we also insist upon the heavy meal at noontime.

Because of restricted activity, energy and caloric requirement will necessarily be reduced. In this class the foods which produce intestinal fermentation should be entirely avoided. Cabbage, cauliflower, brussels sprouts, turnips, corn, navy and lima beans, onions, peas, radishes, and excessive sweets are the chief offenders. Use no salt after food comes to table. In addition, in Class II-B no raw fruit or raw vegetable and no salt to be used in cooking. We also suggest fermented milk in preference to raw milk in Class II-B.

TABLE III

DIET 2. AVERAGE DAILY MENU FOR CLASSES II-A and II-B.

Breakfast: Same as Class I.

	SERVING	WEIGHT (GM.)	PROTEIN (GM.)	FAT (GM.)	CARBOHYDRATE (GM.)	CALORIES
Dinner:						
Lamb (roast leg)	1 slice	54	10.2	6.5	0.0	100
Baked potato	1	120	2.64	1.0	22.0	100
Spinach	1 cup	200	1.2	0.36	8.0	40
Whole wheat bread	1 slice	42	4.0	0.4	20.9	101
Butter	½ ball	7.5	0.05	6.3	0.0	50
Baked apple	1 med.	80	0.2	0.64	23.5	100
Total			18.29	15.20	74.4	491
3:00 P.M.:						
Buttermilk	1 cup		7.2	1.2	11.5	86
Supper:						
Rice (steamed)	¾ cup	100	2.28	0.09	22.5	100
Tomato	½ med. size	100	1.20	0.2	4.0	23
Milk	glass	220 c.c.	7.3	8.8	11.0	157
Bread pudding	¾ cup	100	5.04	8.07	15.9	156
Whole wheat bread	1 slice	42	4.0	0.4	20.9	101
Butter	½ ball	7.5	0.05	6.3	0.0	56
Total			19.87	23.86	74.3	593

Total for Day:

Protein 59.86 grams; Fat 57.22 grams; Carbohydrate 224.75 grams; Calories 1,630.

Protein 12.1%; Fat 30.9%; Carbohydrate 56.2%.

The diet for Class III, offers a complete alteration. Here we suggest two types of diet. Contrary to the opinion of Reid[40] and others, we agree with Goodman[41] and Rubow[42] that a strict Karell diet properly serves to rest the digestive tract and circulation, and also by its low fluid content favors a decrease in edema. We therefore insist upon a strict

Karell diet in the acutely decompensated case for twenty-four to forty-eight hours. Then we immediately shift to a modification in which we greatly enhance the calories present together with the necessary elements and vitamins. (Table IV.)

In acute decompensation, 150-200 c.c. of skim milk or fat-free buttermilk is given at four-hour intervals during the day, hot or cold, according to taste. Raw whole milk tends to cause gastric distress. Gradual increases are made, depending on the general improvement. A soft-boiled egg without pepper or salt at 10 A.M., a piece of Zweibach at 6 P.M. Fluids are still restricted to 800 c.c. a day until a full diet is reached.

TABLE IV

DIET 3. MODIFIED CLASS III DIET.

	WEIGHT (GM.)	PROTEIN (GM.)	FAT (GM.)	CARBOHYDRATE (GM.)	CALORIES
Breakfast:					
Bread (toast)	20	4.0	0.5	20	50
Prune juice	40	0.25	0.0	12	50
Buttermilk	240	7.2	1.2	11.5	86
Dinner:					
Bread	20	4.0	0.5	20	50
Cream soup (asparagus)	125	3.44	8.52	4.87	114
Butter (saltless)	7.5	0.5	6.3	0.0	50
Ice cream	50	1.5	6.0	10.0	100
Supper:					
Bread	20	4.0	0.5	20	50
Buttermilk	240	7.2	1.2	11.5	86
Butter	7.5	0.5	6.3	0.0	50
Egg	4.5	6.03	4.72	0.0	66
Total		38.62	35.84	109.87	752

As improvement ensues, this diet is gradually to be carried into Diet 2. Patients in all groups, especially in Classes II and III should be taught to masticate the food thoroughly to aid salivation and digestion. Frequently a patient in any class has absolutely no appetite and refuses to eat. This suggests a previous mismanagement in the daily regimen, and calls for a low caloric diet for a few days to allow for the reappearance of the normal appetite.

In concluding this paper, may we quote Mackenzie who said, "It is important to consider that we must be guided by a good deal of common sense. To have a patient made conscious at every meal of his heart trouble perhaps brews an added injury of mental ennui." The food should be varied, but never forced. The guiding principle should be food well cooked and temptingly presented. Endeavor to serve food the patient likes, so long as it does not basically distort the caloric requirements or disturb the digestion. By following these dietary suggestions we do not endeavor to obtain a direct effect on the organic cardiac affection, but indirectly the cardiac condition may be favorably influenced by the proper food.

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164 Arlington Avenue, Brooklyn, N. Y.
164 West Seventy-Ninth Street, New York City, N. Y.

EXSTROPHY OF THE BLADDER (PERSISTENT CLOACA) ASSOCIATED WITH INTESTINAL FISTULAS

With a Brief Analysis of 36 Cases of Anal and Rectal Anomalies from the Records of Charity Hospital in New Orleans

J. Ross Veal, B.S., M.D., and Elizabeth M. McFetridge, M.A.
New Orleans, La.

EXCEPT to specialists in the field, embryology is a subject difficult and confusing, and for that reason it is seldom of interest to the physician in clinical practice. It is never possible, however, to ignore it in the discussion of any congenital anomaly; indeed, the more marked is the deviation from the normal, the more important is the study of the origin of the variation. For this reason it is logical to introduce this report of multiple anomalies of the genitourinary and lower intestinal tracts in a newborn child with a brief statement of the embryology of the involved areas, for the fundamental defect was a retention of the embryonic cloaca, which for some reason did not differentiate in the normal course of development into the rectal and urogenital spaces.

The lower intestinal and the urogenital systems both arise from a common origin in the hind-gut, this being the lower third of the primitive gut tract and the embryonic structure from which the lower half of the colon and the rectum later develop. About the third week of embryonic life it exhibits in its lower third a caudal expansion or dilatation, the cloaca, which is the opening into which the primitive intestinal, urinary, and genital systems empty. The hind-gut is lined with entoderm and terminates blindly at the caudal end of the embryo, but just above this blind termination there is located a differentiated structure, the anal membrane, which by the end of the fifth week has become depressed to form the anal pit or proctodeum, while that portion of the tube caudal to it, the postanal gut, gradually becomes obliterated.

On the anterior surface of the hind-gut, just above the cloaca—some authorities state within the cloaca—is a diverticulum, the allantois, which appears about the fifth week, and from which are formed the bladder and the primitive urogenital sinus. At the end of the second month a septum, the urorectal fold, divides the cloaca into two portions, an anterior or urogenital space, within which the urogenital system develops, and a posterior or rectal space, within which the lower intestinal system develops. From this time forward, therefore, these two systems, which arise, as we have pointed out, from a common origin in the hind-gut, develop as separate and distinct structures, completely differentiated in both form and function, or rather, they so develop if intrauterine life proceeds normally. If for any reason it does not, various anomalies are later apparent. Single malformations may occur, but associated defects are more likely to be present, as in the extreme

From the Department of Surgery of the Louisiana State University Medical Center and the Surgical Service of the Medical Center in Charity Hospital.

instance we are reporting. This baby exhibited a complicated exstrophy of the bladder associated with fistulas of the intestinal tract, representing a failure of development of the urogenital septum and a persistence of the cloaca; an absence of the lower intestinal tract and the rectum, representing at least a failure of absorption of the anal membrane; a persistence of the postnatal gut; and a marked spina bifida.

CASE REPORT

A colored child of undetermined sex, aged two days, was admitted to Charity Hospital February 11, 1933. As happens rather frequently in this institution, it was simply deposited in the hospital by persons from whom it was impossible to obtain any story which would throw light on the conditions present, and with whom it was impossible to make further contacts. For this reason nothing is known of the type of delivery, or of the heredity and environment.

The child was apparently at full term and weighed 5 pounds 4 ounces. The cry was of normal loudness. There was a fair amount of subcutaneous fat, and

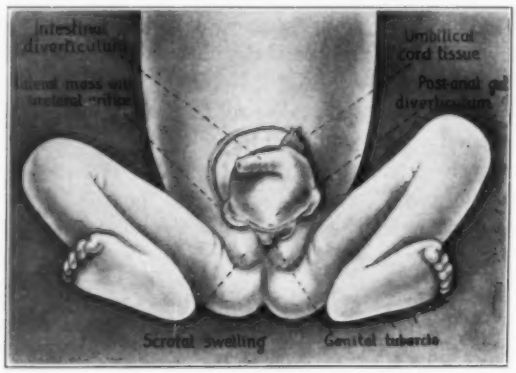

Fig. 1.—External view of anomaly.

nothing unusual was noted about the color or texture of the skin. The head, neck, thorax, and extremities revealed no abnormalities. The umbilical cord was in the usual location, but just below it was a large, protruding mass, from the center of which intestinal contents escaped and which increased in size when the child cried or strained. It was reddish in color, was covered with mucous membrane, and was evidently composed of intestines. Apparently there was a wide separation of the rectus muscles, and the mass described filled the intervening space, though it did not overlie the skin. From the edges on either side several sutures of catgut were hanging, an attempt evidently having been made, of course without logic and with a corresponding lack of success, to return the ectopic structures to the abdomen. There was no external anal orifice, and since the bladder opening and the external genitals were absent from their normal locations, it was impossible to determine the sex on inspection.

From the center of the mass (Fig. 1) a finger-like projection of gut extruded, from which fecal matter, with the appearance of contents of the small intestine, was escaping. On either side of the large central mass was a small, lateral mass, red and irregular in outline, from which urine dribbled, although the points of exit could not grossly be identified. Joining these two lateral masses and located within the lower portion of the central mass was a thin pouchlike band, just above which,

in the midline, was a small fistulous opening which admitted a probe for a distance of 2 cm., while immediately below the band a small tubercle projected anteriorly. This tubercle was solid, with a small depression on the lower surface, and just lateral to it were two soft, rather vague masses covered with skin, which had the gross appearance of scrotal tissue.

The condition was clearly a congenital anomaly, presumably in a male child and presumably representing a failure of development in the lower intestinal and genito-urinary systems, although the exact nature of the defect and its full extent were not clear. Various diagnostic aids were therefore resorted to. X-ray examination following the injection of barium into the external opening of the central projection of gut revealed several coils of intestine within the abdominal cavity, but no evidence of a colon or rectum. Indigo carmine was recovered from the lateral masses fifteen minutes after the intravenous injection of 1 c.c. of the dye, and openings were thus

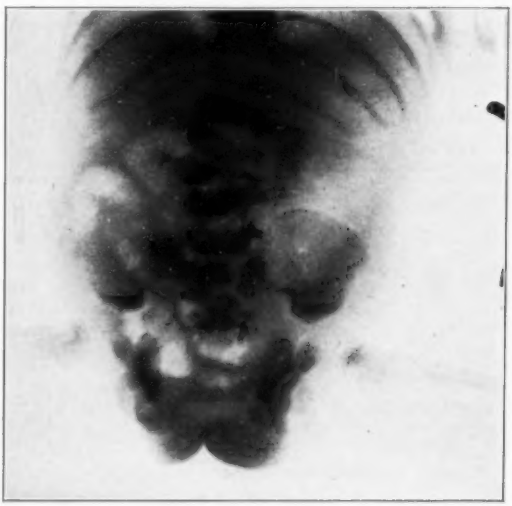

Fig. 2.—X-ray view of spine, showing spina bifida and wide separation of the pubic bones.

identified which were considered to be the ureteral orifices. An intravenous pyelogram was undertaken, but the kidneys could not be visualized. Sections taken from the lateral masses were studied microscopically, but the study was not satisfactory, the pathologists being able to make out only glandular tissue. X-ray of the skeleton revealed another anomaly which had not been evident grossly, a spina bifida with a very marked separation of the pubic bones (Fig. 2). As the result of the clinical study and of these various laboratory tests, it was possible to make a clinical diagnosis of persistent cloaca, with exstrophy of the bladder, undescended testicles, partial exstrophy of the intestinal tract, and absence of the rectum and anus, associated with spina bifida. It is only fair to add that we were materially aided in our diagnosis by von Geldern's classic paper on *The Etiology of Exstrophy of the Bladder*, in which he reports an almost exactly similar case.

Operation was not considered, as the condition was frankly incompatible with life. The child was fed on a formula and did remarkably well for about a week. Then the protruding mass became grossly infected, smears revealing gram-positive

cocci (streptococci), and death occurred, probably from exhaustion, February 23, 1933, the twelfth day after admission and the fourteenth day of life.

At postmortem examination the body showed marked wasting of the tissues, while the puckering and retraction of the skin normally present after the umbilical cord has fallen off were not noted. The right umbilical artery was absent, but otherwise, except for the spina bifida, the malformations were confined to the organs of the abdominal cavity. The mesenteric relationships were unfortunately disturbed at the beginning of the autopsy and therefore cannot be reported upon accurately. The gallbladder, liver, spleen, stomach, duodenum and jejunum exhibited no abnormalities, but the appendix and cecum were missing, and the 55 cm. of intestines present seemed to be entirely small bowel; grossly there was no evidence of the large bowel, and microscopic study later failed to reveal any structure characteristic of it within the abdomen or in the exstrophic membranes.

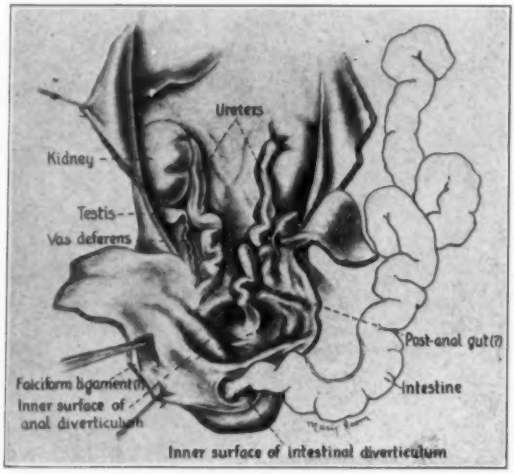

Fig. 3.—Internal organs after postmortem dissection.

The projecting intestinal mass proved to be an intussusception; the portion through which bowel contents escaped was quite narrow, about the diameter of a lead pencil, though the intestinal tract above it was of normal caliber. When the intussusception was reduced, no abnormalities were evident other than the abrupt termination of the intestinal tract. The small fistulous opening lying centrally in the large mass, below the intestinal opening, proved to be the external orifice of a tube which coursed upward through the roomy pelvis (Fig. 3), over the pubic region, passing backward into the posterior cavity and then ascending to the level of the anterior inferior iliac spine, where it ended blindly. Upon further study we reached the conclusion that this structure was a remnant of the postanal gut.

The pouchlike band connecting the two lateral masses had to be studied microscopically before its nature could be determined; as it was covered with epithelium of the stratified transitional type, it could then be identified as a rudimentary bladder. The tubercle just below the bladder proved to be the rudimentary penis, while the masses just below and lateral to it were, as we had suspected, the ununited halves of the scrotum.

The kidneys, which measured 3 by 5 cm. and were about equal in size, both retained their fetal lobulations; the right was located slightly higher than the left. Below each kidney, in contact with its inferior pole, was a triangular body 1¼ by 1 cm., which on section and microscopic study was found to be composed of testicular tissue. At the medial margin of each testis (Fig. 3) was a narrow tubule, later identified as the vas deferens, which coursed forward and medially, to open finally into the distal portion of the ureter. Both ureters were dilated and exceedingly tortuous, and their downward and forward course was complicated by several bends and loops before they terminated in the lateral external masses which had been identified antemortem as the ureteral orifices. Further microscopic study of sections from these masses showed them to consist of a network of blood vessels covered by epithelium of the stratified transitional type, instead of the simple glandular tissue reported antemortem, and confirmed their identification as part of the urinary system.

The final diagnosis, therefore, is exstrophy of the bladder associated with intestinal fistulas, or, what we believe to be a more logical and more accurate nomenclature, retention of the cloaca, resulting in or associated with the following anomalies: intussusception of the lower end of the small intestine; absence of the anus, rectum, colon, cecum, and appendix; persistence of the postanal gut, with external opening; rudimentary penis; undescended testicles; tortuosities of the ureters; rudimentary bladder; spina bifida.

We have purposely reported the postmortem and microscopic findings in no great detail for the reason that, except for the absence of the appendix, this case is almost identical with the case which was reported in meticulous detail by von Geldern, and which we have already mentioned as of material diagnostic aid to us. In the same paper von Geldern has collected 14 other cases of ectopic bladder associated with fistulas of the intestines, 8 from the Museum of the Royal College of Surgeons and 6 from the museums of various metropolitan medical schools. Since his discussion of the etiology and classification of this very rare condition is so exhaustive, we do not feel justified in doing more than putting our own case on record and in making a brief comment on it. We might add that from 1920 to date, although 9 cases of exstrophy of the bladder have been handled at Charity Hospital, no case similar to this one has been found in a careful search of the records.

All of the cases collected by von Geldern have a striking similarity in the details of the malformations they exhibit, and they must obviously, as he points out, share a common etiologic factor, though what that factor is is not yet entirely clear. He reviews the various theories at length, and is inclined to accept, in spite of superficial objections to it, the theory of T. B. Johnson, which is based on the fundamental assumption that the primitive hind-gut gives origin to a much larger part of the alimentary canal than is generally supposed, whereas the mid-gut forms very much less. It might be mentioned that the case reported by Johnson, on which his exhaustive study is based, was similar to ours in that the appendix was missing, although it differed from it and from the other reported cases in that associated spina bifida was not a feature.

A few words might also be added concerning the so-called postanal gut, the exact origin and function of which have never been determined. Von Geldern has classified the reported cases into 4 main types, and quotes Sequeira to the effect that this structure represents the entire large intestine, with a rectum which ends blindly, and with the cecum and the vermiform appendix represented by appendices. This explanation obviously does not fit our case; the postanal gut terminated blindly, there was no evidence of the vermiform appendix or the cecum, and no tissue characteristic of the large bowel could be demonstrated by multiple sections.

In the course of our search for congenital anomalies of the bladder and intestinal tract among the Charity Hospital records, we discovered 36 cases of anomalies of the rectum and anus treated during the last thirteen years, and it occurred to us that it might be of value to attach to this report a brief analysis of them. The majority of these cases were diagnosed as imperforate anus, a term which is generally used in medical literature to describe any type of congenital malformation of the anus and rectum, but one which seems to us wholly inadequate as an anatomic diagnosis. It means nothing beyond a closure or absence of the natural anal opening, and as such it is confusing and misleading, for that closure or absence may be caused by different conditions, and rational methods of treatment cannot be described and evaluated unless the fundamental pathology is clearly understood. We have therefore adopted the classification of these anomalies set forth by Fraser in his *Surgery of Childhood*, and on that basis have classified the 32 cases from the Charity Hospital records in which the data were sufficient to permit such a study; 4 cases had to be excluded because the description was incomplete, the anomaly being set down merely as imperforate anus.

I. Congenital Malformations of the Anus—18 cases.
   a. Congenital narrowing (stenosis) of the anal canal—3 cases.
   b. Congenital occlusion of the anal canal (all complete)—4 cases.
   c. Abnormal location of the anus—3 cases.
   d. Congenital absence of the anus—6 cases. In 2 other cases it was impossible to tell from the records whether the anus was absent or merely occluded.

II. Congenital Malformations of the Rectum—3 cases. All of these cases were complete atresias. Fraser's other classifications include total absence of the rectum, membranous occlusion of the rectum, and rectovaginal, rectourethral, and rectovesical fistulas.

III. Associated Congenital Malformations of the Anus and Rectum—11 cases (all with rectovaginal fistulas).
   a. Congenital occlusion of the anal canal (all complete)—3 cases.
   b. Congenital absence of the anus—6 cases. In 2 other cases it was impossible to tell from the records whether the anus was absent or merely occluded.

The incidence of anomalies of the anus and rectum is supposed to be approximately 1 to every 10,000 deliveries, and it is apparent from this list, and from similar lists, that malformations of the anus are very much more frequent than malformations of the rectum, a fortunate circumstance, since they are potentially less serious and since they are far more amenable to surgical correction. It is apparent from the above classification, too, that the point we have already made is correct, that the term "imperforate anus" is entirely unsatisfactory from the standpoint of pathologic classification as well as of therapeusis.

Thirteen of the 36 babies died, a mortality rate which is very high, but which is about what is to be expected under the circumstances. The deaths include:

Three cases described as imperforate anus and impossible to classify more accurately; all were treated by colostomy.

Three cases of occlusion of the anus; 1 was treated by colostomy, 1 by a plastic procedure, and 1 child was not operated on.

Two cases of absence of the anus, both treated by colostomy.

One case of abnormal location of the anus, for which a plastic procedure was done.

Three cases of atresia of the rectum; 2 were treated by colostomy, the third by perineal drainage.

One case of associated anomalies of the rectum and anus, with a rectovaginal fistula, for which no surgery was done.

In 2 of the fatal cases no surgery was done, there were 2 deaths in the 12 cases handled by plastic operations, and there was a 100 per cent mortality in the 8 cases handled by colostomy. Of the 18 babies with complete obstruction 10 died in the hospital, and 1 child, removed by the parents against the advice of the staff, undoubtedly died shortly thereafter.

These figures suggest several rather interesting considerations. Only 1 of the 11 children with anal and rectal anomalies associated with rectovaginal fistulas died, which seems to prove again that if the fistulous opening is large enough to permit adequate elimination, the child's chances of survival are good. Indeed, many cases are on record in which such an anomaly was discovered for the first time in adult life, during the course of labor, the woman up to then having been entirely unaware of her condition, and Morgagni reports one instance in which the patient lived with this anomaly for over a hundred years. These cases, of course, are exceptional, but there is no doubt that many times the child exhibits no symptoms and the malformation is discovered accidentally by the mother or the nurse. If, however, the fistulous tract is inadequate, symptoms of obstruction develop rather promptly, their degree depending upon the degree of stenosis, and surgical relief be-

comes imperative. Although in this series there was no instance of an anomaly of the anus or rectum associated with a fistulous opening into the urethra or the bladder, it should be pointed out that in such cases, particularly when the opening is into the bladder, the immediate institution of surgery is most important, for fatal urinary infection is otherwise almost inevitable. All congenital malformations of the anus and rectum are more frequent in the male than in the female, and associated fistulas into the urethra and bladder are also more frequent than they are in the female, in whom the uterus and vagina are interposed between the bladder and rectum.

It goes without saying that all newborn babies should be routinely and carefully examined for possible malformations of this sort, and that surgical correction should be promptly undertaken unless it can be demonstrated that a fistulous opening into the vagina exists and that adequate elimination is possible through it. Delay in the hope that the child will later be in better condition to withstand surgery is fallacious and unsound reasoning. For one thing, a newborn child withstands operation surprisingly well. For another, death is inevitable, when the occlusion or atresia is complete, unless mechanical relief is instituted, and the chances of life are therefore greater with surgical treatment, however serious it may be, than when it is withheld. Colostomy may seem the logical procedure, but the results prove it to be a very unsafe one, however simple of performance it may be. The 100 per cent mortality in this series is paralleled or approximated by the mortality in other reported series, and there seems little question that immediate plastic surgery gives better results. For trocar incision and drainage there is nothing to be said, as indeed there is nothing to be said for surgery that is done sight unseen in any location.

The ethics of operation in the presence of congenital malformations introduces some interesting problems. That surgery is warranted in anomalies of the anus and rectum such as we have just listed, there is no doubt; the child is in jeopardy without it when the occlusion is complete, or almost complete, and however high the death rate may be, it cannot be higher than it is in such cases when no surgery is done. In such an anomaly as we have reported, however, the situation is very different. It was obvious from the gross study that the anatomic defects were so great, the deficiencies of structure so fundamental, that any sort of surgery would have been simply an unwarranted use of the knife. It could not possibly have remedied the conditions present, and the wisest and most humane procedure was beyond doubt the one that was adopted, to let the unfortunate child die in its own way.

SUMMARY

1. A case is reported of multiple congenital anomalies of the urinary and lower intestinal tract, resulting chiefly from a retention of the cloaca.

2. Reference is made to von Geldern's exhaustive study of the etiology of exstrophy of the bladder, and to his report of a similar case.

3. Thirty-six cases of congenital malformations of the anus and rectum, from the records of Charity Hospital in New Orleans, are analyzed from the standpoints of pathology and mortality.

4. The correction of such malformations is considered, and the ethics of operation in the presence of extensive anomalies is discussed.

We desire to express our thanks to Dr. Urban Maes, Director of the Department of Surgery in the Louisiana State University Medical Center, for the privilege of reporting this case from his service, and to Dr. Charles Midlo, of the Department of Anatomy, for his assistance in working out the details of the embryology and anatomy involved.

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A NOTE ON THE USE OF LASSAR'S PASTE IN THE "WEEPING ECZEMA" OF INFANCY

PARK J. WHITE, M.D.
ST. LOUIS, MO.

ALL pediatricians, and many dermatologists, agree that infantile eczema is a constitutional disease, of which the cutaneous eruption is but one manifestation. If we, as pediatricians, consider ourselves primarily responsible for the treatment of this condition, it behooves us to move cautiously when we venture into the domain of local, or dermatotherapy.

A mere glance at the literature suffices to indicate how commonly Lassar's paste has been used in the local treatment of the various forms and stages of infantile eczema.* One widely read textbook on dermatology tells us that in the treatment of acute eczema, 1 per cent of salicylic or carbolic acid is usually the best addition to Lassar's paste, adding, "if indeed the *plain paste without any additional ingredients does not serve all of its purposes. Such a paste should be applied thickly over the surface and covered with gauze or absorbent cotton.*"

Another dermatologist gives essentially the same advice, adding what should receive more general emphasis, that "One of the general principles of treating skin diseases is to remove crusts (with oil) before applying any remedial agent."

A recent experience has shown me how unfortunate is the common tendency among pediatricians to "use Lassar's paste" in acute eczema, without regard to the extent of "weeping" present, or without specifying incorporation of modifying antiseptics or stimulants in the paste.

CASE REPORT

T. C., a white boy, eight months old, was first seen Feb. 16, 1933. He lived in a town thirty miles distant. The family history was free from allergy. His mother had never had any breast milk. The first feeding had consisted of a whole sweet milk and corn syrup modification. Except for a two-week interval during his seventh month, when he was given sweetened condensed milk, he had been kept on modified boiled sweet milk. After the age of six months, Cream of Wheat, Graham crackers, egg yolk, carrots, and spinach had been added to his diet. His severe, itching eczema had begun at the age of two months, varying considerably in intensity. He had always been fretful. His bowels had always been regular, the stools

From the Department of Pediatrics, Washington University School of Medicine, and the St. Louis Children's Hospital.

*"Plain" Lassar's paste consists of:

Zinc oxide	7.5
Starch	7.5
White vaseline to	30.0

never showing any abnormality. He had never received any cod liver oil. Throughout its course the eczema had been of the "moist" variety.

Examination revealed an eight-month-old boy, one pound underweight for his height, with severe, moist eczema involving his face, scalp, body, buttocks, and extremities. Two upper and lower central incisors had erupted. There was no evidence of rickets.

He was put on a formula of dried milk with corn syrup, cereals (except wheat), vegetables, orange juice, and cod liver oil. The mother was carefully instructed in the application of plain Lassar's paste.

The baby was taken home, and was not heard from until five days later, when his mother telephoned to report that he had a cold and fever.

The following day he was brought in with a temperature of 104° F., a mucopurulent discharge from his nose, and thick, firm crusts all over his face. Round the outer edges of these crusts were the undermined circinate blebs typical of acute, spreading impetigo. There was considerable excoriation at the site of the nasal discharge. Acute conjunctivitis had just begun. He was obviously toxic, but not dehydrated. He was sent at once to the hospital, where the following blood picture was found:

Hemoglobin	65%
Red cells	4,130,000
Leucocytes	13,050
Stabkernige	10%
Segmented cells	41%
Lymphocytes	46%
Monocytes	3%

Wassermann and Mantoux tests and urinalysis were all negative.

A blood culture was ordered, in view of the possibility of a staphylococcus septicemia. He was temporarily allowed the evaporated milk feeding usually employed at the hospital.

The hard, thick crusts were lifted off; underneath them was a considerable amount of seropurulent material. After this was removed, 4 per cent xeroform ointment was applied and kept in place with a muslin mask. His eyes were treated with boric acid washes. The site of greatest infective activity was at the left ala nasae, where the mucopurulent rhinitis was most in evidence.

Two days later his temperature was normal and remained so. Four days after admission he was discharged. Through an error, the blood culture was not made before his temperature dropped. The dried milk feeding was resumed, with the addition of rice, tapioca, string beans, carrots, 10 D cod liver oil, and orange juice.

The following prescription was given for local use:

	GM. OR C.C.
Crude coal tar	
Boric acid	āā 4
Zinc oxide	15
White vaseline, to make	60

COMMENT

It was unfortunate that distance and the depression kept the parents from bringing the baby back at the very onset of his febrile disturbance. At all events, we felt quite sure that the thick, nonantiseptic paste favored the formation of firm crusts over the "weeping" surface, without inhibiting the growth of bacteria introduced under the crusts, probably from the nasal discharge with the help of the baby's scratching.

If more pediatric and dermatologic writers warned against the possibility of untoward results from the use of unmodified Lassar's paste in "weeping" infantile eczema, this paper would be without useful function.

The most definite pronouncement on the subject under discussion is that of Engman.[1] "Pastes should be applied thinly. Since they contain equal parts of grease and powder, they dry rather slowly on the skin. They do dry, however, and the affected surface should be watched carefully, lest secondary infection develop." Again, "Crude coal tar is mildly antiseptic."

CONCLUSION

In the local treatment of the acute moist eczema of infancy, particularly that involving the face, the likelihood of secondary infection must be kept in mind. Crusts should be removed with oil before pastes are applied; too high a proportion of powder should not be incorporated in the paste; a mild disinfectant-stimulant, such as crude coal tar in proper proportion, should be more generally added. Applications should be made, and dressings changed, frequently.

REFERENCE

1. Engman, M. F., Sr., in D. P. Barr's "Necessary Drugs and the Knowledge Essential to Their Use," p. 111.

THE AGE OF CHOICE FOR OPERATIONS OF CHOICE IN INFANCY AND CHILDHOOD

THOMAS H. LANMAN, M.D.
BOSTON, MASS.

A LARGE proportion of the surgical procedures that are indicated in infants and children are operations of choice. In nearly all these cases operation is performed to relieve a condition due to some congenital defect, or to correct an existing defect which later in life might prove to be a serious handicap to proper growth and development. This paper briefly presents our opinion as to the time of selection at which operation for relief of these various conditions is advised. It is based on the experience of the surgeons of this hospital who have an extensive experience in this surgical field.

The rapid advance in modern surgical technic is responsible in part for the disregard of the incidental dangers of any surgical procedure. These dangers are relatively greater in the small patient, whether the surgical procedure is of minor or major importance.

If upper respiratory complications and gastrointestinal disturbances incidental to a general anesthetic occur, they are more formidable in the young patient than in the adult. In this climate (New England) the seasonal high peak of upper respiratory infections of the late winter and early spring must be kept in mind. On the other hand, small patients should not be subjected to an operation of choice during periods of excessive heat.

The small patient does not stand a small amount of hemorrhage as well as the adult, and will show signs of surgical shock sooner and from relatively less trauma. Loss of body heat during operation must be carefully guarded against. The preventive treatment of postoperative acidosis is of extreme importance.

In general, we are guided by the type of lesion requiring operation. We feel very strongly that the less surgery that is done during the first two years of life, the better. Therefore, if the lesion is in no way incompatible with the normal development of the child, operation is usually postponed until the end of the second year, or at least until the child has passed his second summer. This rule is followed more strictly in cases in which the operation will be of major character. If the condition requiring operation is not compatible with normal development of the child, earlier operation is needed. But we must always bear in

From the Surgical Service of the Children's Hospital, Boston, and the Departments of Surgery and Pediatrics, Harvard Medical School.

mind that the presence of some condition that adds unduly to the surgical risk of operation is cause for postponing the operation even at the cost of not obtaining so satisfactory a result.

HERNIA

Indirect inguinal hernia is one of the more common congenital defects. In nearly all cases a simple woolen yarn truss will keep the hernia reduced. This truss is easily applied, is soft, washable, and not irritating. With intelligent cooperation on the part of the mother, the yarn truss will usually suffice until the child is about two years of age. Operation is then advised. We believe operation to be essential to cure. If it is not possible to hold the hernia by this method, operation may be done at any time. Incarceration or strangulation, while rare in this age group, makes operation one of necessity and not of choice. Indirect inguinal hernia in girls is far less common than in boys. It must be remembered that in girls there may be a prolapse of the ovary through the internal ring, and if the ovary cannot be replaced by taxis, a truss of any sort is inadvisable, as it may interfere with the blood supply to the ovary. We advise operation in cases in which the ovary is prolapsed and cannot be reduced. Although strangulation of the ovary in these cases is not common, if it does occur it usually means sacrificing the ovary.

Umbilical hernia is very common and the majority of cases do not require operation. Most small umbilical hernias can be cured by efficient and continuous strapping with adhesive tape. It is essential to have the strapping continuous, and not to use any object, such as a coin, over the navel. The recti muscles must be rolled toward the midline and held in apposition. Even a large hernia can be held by strapping until the child is one and a half or two years of age when operation is advised. Large congenital defects of the umbilicus, such as omphalocele or hernia into the umbilical cord, require immediate operation.

HYDROCELE

Hydrocele in male infants is usually hydrocele of the tunica vaginalis only. In most cases the hydrocele disappears spontaneously before the age of two years. Tapping may be done, although there is but little evidence that this is of permanent benefit. If the hydrocele extends up the spermatic cord as well as involving the tunica vaginalis, it generally requires operation. These cases may be confused with scrotal hernia. In differentiating, it is found that hydrocele of the tunica vaginalis and spermatic cord presents a pear-shaped irreducible, and translucent mass, the larger end being in the scrotum and the narrower extending up the spermatic cord toward the inguinal canal. The upper end becomes gradually smaller and ends in the canal. There are no symptoms of strangulation or incarceration of the bowel. The mass remains the same size at all times.

In nearly all these cases there is a very small hernial sac at the internal ring but not connected with the hydrocele sac. The associated hernia in this type of hydrocele is one important reason for radical operative cure. Hydrocele of the canal of Nuck in girls, like hydrocele of the cord in boys, requires operation, as it is also usually associated with an inguinal hernia.

HARELIP AND CLEFT PALATE

In harelip the urgency of early operation depends on the degree of the associated defect in the upper maxillary bone. The common associated defect is a cleft of varying width in the maxilla on the affected side, and also a projection forward of the premaxilla, or central portion. It is important that the premaxilla be aligned in apposition with the rest of the upper maxilla fairly early in life. This alignment can be done comparatively easily in the first few weeks of life, as the bone is soft. Early operation entails less trauma to the bone, and less danger of injury to the tooth buds. If the child's physical condition warrants, operation for correction of harelip is done between the ages of three and five weeks. The same age applies to double harelip. In these cases there is practically always a serious defect in the maxilla, usually with a marked projection forward of the whole intermaxillary bone. Proper alignment of the upper jaw gives a more normal foundation for the overlying lip and is therefore an important step in securing a good cosmetic result.

Cases of harelip uncomplicated by defect in the maxilla may be postponed for any length of time. On account of the unsightly deformity, however, we usually repair the lip within the first three months.

Repair of the cleft palate whether or not associated with harelip is best done between the ages of eighteen months and two years. It is advisable to operate before the child has learned to talk. If the child is already talking, closure of the cleft in the roof of the mouth does not in itself entirely correct the speech defect. The child must be retaught the use of the vocal muscles to overcome the nasal quality in the speech. Postoperative speech training is usually needed, in greater or less degree, in all cases of cleft palate.

In both harelip and cleft palate it is essential that the child be in good enough condition to warrant undergoing a long operation and one that may incur a moderate degree of hemorrhage. A steady gain in weight is one of the best guides, especially in infants. Absolute freedom from any nasopharyngitis is essential. Any upper respiratory infection, however slight, may cause an infection of the suture line and failure of the entire operation.

SPINA BIFIDA

We believe that operation is indicated in those cases that show either no, or only a small, degree of nerve injury below the site of the lesion.

Cases with no spinal involvement are usually the simple meningoceles. The lesion has usually a normal skin covering, a more pedicled base, and only a small bony defect in the spine. These are more likely to be at a higher level on the spine than the meningomyeloceles.

In meningomyelocele there are nerve fibers in the sac in addition to the meninges and cerebrospinal fluid. This type is usually larger than a simple meningocele; has a broader base in association with a considerable bony defect of the spine, and is commonly situated in the lumbar region. Removal of the sac does not benefit the paralysis below the lesion. There is usually a paralysis, complete or partial, of the rectal and bladder sphincters, and muscles of the perineum and legs.

In cases that show little or no paralysis, operation may be done at any time in the first few weeks of life if the child's general condition warrants.

It is impossible to foretell or prevent the postoperative development of hydrocephalus in any case, whether simple meningocele or meningomyelocele. Postoperative hydrocephalus is less common in simple meningocele.

UNDESCENDED TESTES

True nondescent of the testis is less common than supposed. Frequently, infants are diagnosed as having undescended testicles, who have a condition that simulates it, but is only an abnormally movable testis with an active cremaster reflex. The testis is in the scrotum at one time and high in the inguinal canal the next. A testis that has ever been seen in the scrotum or can be brought well down into the scrotum by taxis is not a true undescended testis, and unless hernia is present, operation is not needed.

The true undescended testis cannot be brought down into the scrotum and may, indeed, be not even palpable in the inguinal canal. There is also an underdevelopment of the scrotum, which, on the affected side, is merely a slight bulge of the skin. There is always a small indirect hernia on the affected side.

Operation is best postponed until the boy is eight or ten years of age. The proper maintenance of blood supply to the testis is of great importance in the future development of the testis, and as the technical difficulties of preserving the proper blood supply at operation are less at an older age, we advise waiting until eight or ten years of age. The associated hernia is, of course, repaired at the same time. It is important that the attempt to place the testis in the scrotum be made before puberty.

Maldescent of the testis or ectopic testis also occurs; in the abdominal wall, on the anterior rectus sheath just above the external ring, in the region of Scarpa's triangle, or less commonly the testis is in the perineum. In such cases we wait until the boy is eight or ten years of

age before operating. If, however, the ectopic testis is in such a position that it is subject to undue trauma, operation at an earlier age may be necessary. Such cases are rare.

HYPOSPADIAS

In this condition the abnormal urinary meatus may be in three locations:

1. Balanitic type, in which the meatus is just below its normal site, in the region of the frenum.
2. Penile type, in which the meatus is along the under surface of the penis and may be as far back as the penoscrotal angle.
3. Perineal type, in which the meatus is in the perineum.

The further away the meatus is from the normal site, the greater the underdevelopment of the penis. In addition, the penis tends to curve downward. The perineal type is rare and, due to the marked underdevelopment of the penis, the bifid scrotum, and crypt orchidism, the patient's sex may be mistaken. This type may be classified as pseudohermaphrodism.

The balanitic type generally needs no surgical interference other than a dilatation of the abnormal meatus which is usually very small. Dilatation should be done at any age if there are any marked symptoms of urinary obstruction. Such cases should be carefully observed during infancy and early years for urinary obstruction. If there is any narrowing or scattering of the urinary stream, dilatation is advised.

Cases in which the abnormal meatus is within one or one and a half centimeters of the sulcus of the glans can usually be corrected by the Beck operation. This involves dissecting the urethra free down to the penoscrotal angle, pulling it out through a stab wound in the glans, and suturing it to the distal surface of the glans. It is only in cases in which the abnormal meatus is near enough the glans so that the dissected urethra can be pulled through the glans without tension, that this operation is suitable. This type of operation is best done at about five years.

In those cases in which the abnormal meatus is down the penile shaft so far that the Beck operation cannot be done, a new penile urethra will have to be constructed. Operation is here best postponed until there is further growth of the penis itself. We now feel that in these cases it is best to wait until the boy is eight or ten years of age.

The further the abnormal meatus is from the glans, the greater the downward curvature of the penis. These contracting bands, if present, must be freed as a preliminary step to any operative procedure on the urethra.

EXTROPHY OF THE BLADDER

These cases are best treated by the transplantation of the ureters into the rectosigmoid. We advise that this be done between the

ages of three and five. It is unwise to operate at an earlier age, as the child cannot cooperate in being trained to hold urine and feces in the rectum. One ureter should be transplanted at a time, and in the usual case the second may be transplanted from two to four weeks after the first. It is always advisable to excise the bladder mucous membrane later, not only because the extrophied bladder is unsightly and continually secretes a certain amount of mucoid material, but because the constant irritation of the clothing seems to be a causative factor in the development of cancer of the bladder. In the male the associated epispadias should be corrected after the transplantation of the ureters and resection of the bladder mucous membrane. While this may do little to improve the chance of later successful impregnation, the psychologic benefit of a more normal appearance is worth attaining. This operation may be postponed until after puberty if the parts are small, and certainly should not be attempted before ten or twelve years of age.

Present-day methods of ureterosigmoidostomy have greatly lessened the dangers of the operation. When successful, transplantation has so greatly benefited the patient's method of life, that an even greater risk than the operation now entails, is justifiable. These patients are relieved of a miserable physical existence and social ostracism. After operation they can live a very nearly normal life and for a relatively long period of time. There is evidence that patients with extrophy of the bladder have a greater expectancy of life if the ureters are transplanted, than if not. Renal infection, of course, is the usual ultimate cause of death. There are several cases reported of women who have been through pregnancy and successful delivery after ureterosigmoidostomy, for extrophy of the bladder.

WEB FINGERS

In these cases the best possible functional result is important. When more than two fingers are webbed, two or more operations are needed, as it is unwise to try to free more than two fingers at a time. By waiting until three or five years of age, the greater size of the parts will give better chance of a good functional result, and yet not keep the child out of school. Operation for correction of webbed toes can be postponed until the child is three to five years old. Many patients need not be operated upon except for cosmetic reasons.

Deformities of the ear are individual problems. The rarer and more extensive defects and abnormalities, such as absence of an extremity in part or in whole, must also be dealt with as the individual case demands. Seldom will anything be lost by waiting at least for three or five years, and, in general, it is unwise to attempt the series of plastic operations required in these cases before that time.

BIRTHMARKS

Birthmarks suitable for treatment with carbon dioxide snow, or radium, do not require an anesthetic and usually may be treated at any age. In general, small hemangiomas suitable for carbon dioxide give better results if treated before two years of age. Those that are about the mouth may require more conservative treatment. Danger of interference with nursing as a result of treatment, or infection of the lesion after treatment must be balanced against the existing interference with nursing. In those birthmarks that are suitable for excision, it is well to remember that in many cases there may be more hemorrhage than in operations of a major character, and for this reason operation should be done only when the infant is in the best possible condition and preferably at least a year old.

Small growths, such as supernumerary digits, wens, and accessory auricles do not interfere with the child's normal development and no treatment is necessary before two years of age. However, as the operation is a short and simple one, and not accompanied by any degree of hemorrhage, it is often justifiable to do it any time after six months.

CIRCUMCISION

Circumcision for the cure of phimosis is in popular demand during infancy. In ordinary practice a true surgical indication for circumcision during the diaper wearing age is practically nonexistent. Irritation of the prepuce and adjacent skin is nearly always the dermatitis resulting from a diaper soaked with ammoniacal urine. The underlying cause of the condition should be treated during this period rather than having the patient circumcised. We believe circumcision advisable in cases of even moderate phimosis but believe it should be done after the diaper wearing age and before the child attends school.

SUMMARY

While we do not wish to give the impression that necessary surgical procedures should be postponed merely because of the early age of the patient, we firmly believe that there should be a very clear indication for any surgery done during the first two years of a child's life. Though the incidental dangers of surgery at this time are relatively great, with proper and careful technic they can be greatly diminished. But these dangers cannot be disregarded and must be carefully weighed against the actual necessity for the surgical procedure. Some operative procedures now done during the first two years of life have little or no surgical indication. Certainly in infants and young children unnecessary surgery is bad surgery.

Pediatric Clinics

PEDIATRICS AT THE HARVARD MEDICAL SCHOOL

KENNETH D. BLACKFAN, M.D.
BOSTON, MASS.

PEDIATRICS, with medicine, surgery, and obstetrics is a major subject at the Harvard Medical School. The resources available for undergraduate teaching of pediatrics and for the training of physicians who intend to limit their practice to infants and children are afforded through the relationship which exists between the Harvard Medical School and several institutions. These are the Infants' and Children's Hospitals, the Pediatric Division of the Massachusetts General Hospital, the Boston Lying-In Hospital, the Wellesley Convalescent Home, the Harvard School of Public Health, and the Haynes Memorial Hospital for Contagious Diseases. In describing the Pediatric Department, a few words regarding these institutions are necessary inasmuch as the program which has been evolved for the study and teaching of diseases of children is so closely interwoven with the activities of these hospitals.

The Children's Hospital of Boston, among the early institutions in this country to recognize diseases of children as a field separate from diseases of adults, was incorporated in 1869, and provision for the care of about twenty patients was arranged in a "neat and commodious" house at 9 Rutland Street. The next year, 1870, as the house was "crowded to capacity with patients," the managers secured by lease, a larger house at 1429 Washington Street, on the corner of Rutland Street. There the treatment of sick children was continued until 1882 when the patients were moved to Huntington Avenue, where a new hospital for sick children designed "according to the best plans that experience and skill could suggest," had been built.

In 1911, having completed almost fifty years of successful service to children, a campaign was launched to secure funds for a new and more modern hospital. Shortly before this time, the Harvard Medical School had moved to its present location, and as it was considered of mutual advantage to bring together the laboratories of the medical school and the clinical facilities of the hospital, the new buildings were erected on Longwood Avenue adjacent to the Medical School. This hospital was opened to the public in 1914.

From the beginning the Children's Hospital reserved only a few beds for infants; so arrangements for the medical care of infants under two years of age were limited until the West End Nursery Society was incorporated. In 1881, a hospital department was formed and the name changed to the "West End Nursery and Infants' Hospital." The growth of this institution was as rapid as that of the Children's Hospital, and in 1914, a new Infants' Hospital was built on land directly behind the Children's Hospital. This new hospital, designed especially for the medical care of infants, was named the "Thomas Morgan Rotch, Jr., Memorial Building." Since 1923, the Children's Hospital and the Infants' Hospital have functioned as a single unit, but are separate corporations, each raising its own funds and managed by its own board of managers and trustees.

Professor of Pediatrics at the Harvard Medical School and Chief of the Medical Service of the Infants' and Children's Hospitals.

In 1922, a Laboratory Building to meet the increased needs of the research undertakings of the Pediatric Department was built on the hospital grounds. In 1925 this building, which was originally a one-story structure, was extended by an additional story, and now contains complete equipment for the investigation of diseases of children. The major part is used for studies pertaining to disorders of metabolism, by the methods of chemistry. There are also well-equipped laboratories for research in diseases of the blood and for work in problems relating to the field of bacteriology and immunology. In addition there is a bacteriologic and immunologic laboratory where the general laboratory work for the hospital is centralized. This service which functions in cooperation with the Department of

The Main Entrance to the Children's Hospital

Bacteriology of the Harvard Medical School is so organized as to cover all needs of the hospitals for the more routine laboratory tests as well as the more specialized diagnostic measures. A unique feature of the laboratory building deserving description is a large and very beautiful room known as the Laboratory Study, a memorial gift "for study and reflection, with the hope thereby to facilitate discoveries helpful to the healing of children." The room contains journal sets and books, both clinical and scientific, and provides a most helpful retreat for meditation and studious appraisement of research problems.

By 1927 it again became apparent that many departments of the Children's Hospital were overcrowded and that more space was needed. The new buildings which have been constructed are the Gardner House, the Bader Building, the Ida C. Smith Surgical Ward, and the Pathological and Isolation Unit.

The Gardner House is the nurses' residence. In the Bader Building, on the corner of Van Dyke and Vila Streets, there is available space for physiotherapy, together with accommodations for the study of special neurologic cases. The first and second floors are almost ideally arranged for quiet muscle training and corrective exercise work, and a large pool on the first floor has made possible the water-tank treatment of both the early and the late stages of infantile paralysis. In addition, the building affords offices for close relationship between the Harvard Infantile Paralysis Commission, and the Department of Physical Therapy of the Boston Children's Hospital. This cooperation is essential to the unique service which these two groups are able to render to their appealing patients. The third floor of the building has been set aside for future expansion and at present is not in use except for the follow-up treatment of patients after recovery from the acute stages of poliomyelitis. This plan of study is being carried out with the Drinker respirator, in a group of patients who have had respiratory paralysis. The sixth, or top, floor has been equipped with apparatus so as to afford either sunlight or artificial lamp treatment in summer or in winter and on clear or on cloudy days.

The neurologic unit occupies the fourth and fifth floors of the Bader Building. Here facilities have been arranged for continuous observations of twenty patients with mental or physical handicaps or both, under relatively normal living conditions. In addition to the medical staff who are interested in discovering and utilizing every possible physical and mental asset of each child, are a psychologist, a physiotherapist, a teacher, and a social service worker, specially trained to deal with psychiatric problems. A series of optimistic and educational experiments in a field where pessimism has been almost universal are being conducted. At the same time, this new unit is an integral part of the Children's and Infants' Hospitals, and the work is in cooperation with the other services. The other services benefit equally from association with this highly specialized group of workers.

The Ida C. Smith Ward was built as part of Surgical Ward II and affords twenty-eight beds for the pressing needs of infants requiring surgical and orthopedic surgical attention. A waiting room, a special treatment room, a milk room, and other appurtenances so necessary for the care of these small patients, have been provided.

On Van Dyke Street, between the Bader Building and the School of Public Health, there stands a new four-story building which has been designed for the observation and care of patients with communicable diseases, for the routine activities in pathology, and for research and teaching. The larger part of the basement and first floor serves as the headquarters of the Pathological Department of the Children's and Infants' Hospitals. There are laboratories for routine and research and also a memorial library. Last year, there were 249 autopsies and a corresponding increase in the examination of surgical specimens. In this field a great opportunity for the advancement of knowledge regarding disease is afforded.

The Isolation Unit occupies the remainder of this building. The initial admitting room for patients is sharply separated from the laboratories on the first floor. On the second floor there are special laboratories for the investigation of communicable diseases, a teaching room for students, roentgenologic equipment, and an operating room. The administrative offices and house officers' rooms also are on this floor. The third and fourth floors are arranged for the care of patients. There are twenty-six separate rooms, each room being constructed and equipped for complete isolation of the sick child. Six rooms have separate baths. The separate isolation rooms are sufficiently large to permit, in stress of epidemic times, treatment in one room of two patients with the same disease. There are no wards or cubicles. A novel

feature, essential for the modern treatment of the acute phase of the respiratory form of infantile paralysis, has been the equipment of four rooms with Drinker respirators.*

The third floor of the Out-Patient wing has been rearranged as a compact, modern Ear, Nose, and Throat Unit. The ground floor of the Out-Patient wing is devoted to the admission of patients to the Out-Patient Department and the hospital wards. The first floor is used for surgical and orthopedic patients and on this floor offices for the Social Service Department are set aside. Although the social service workers are primarily concerned in meeting social responsibilities of the hospital such close contact affords an excellent opportunity to encourage the teaching of social medicine to students, graduates and practicing physicians. The second floor is used for medical patients. A complete new and modern roentgenologic laboratory occupies the fourth floor.

In the other wing of the administration building are facilities for the care of private patients. Four floors have been set aside for this purpose in which arrangements can be made whereby mothers may stay if they so desire; there is also a separate operating suite in this wing.

The Children's and Infants' Hospitals contain 306 beds that are available for public ward service, and forty-two beds for private ward service. The public ward beds are distributed as follows: Medical service one hundred four, forty-four of which are for children, fifty for infants and ten for the special care of premature infants; Surgical ward sixty-six, twenty-eight of which are for infants; Orthopedic ward forty-seven; Tonsil and Adenoid ward thirteen; Nose and Throat ward eighteen; Neurologic ward twenty; and Isolation ward thirty-eight beds. During the year of 1932, 778 patients were admitted to the Medical ward for children over two years of age, and 845 patients were admitted to the Infants' Hospital. In connection with the hospital and under its supervision, there is maintained at Wellesley, Massachusetts, a Convalescent Home, where both children and infants may be sent for further care. The Convalescent Home is fully staffed, is under the supervision of a member of the Pediatric Department, and contains seventy-five available beds, complete isolation pavilion, solarium, infants' ward, recreation rooms, classrooms, and spacious playgrounds.

Special clinics have been developed in the Out-Patient Department for the management of those diseases which require special study or prolonged treatment. At the present time there are clinics for the purpose of caring for the well baby, for children with rheumatic affections, with syphilis, with tuberculosis, and malnutrition; and for patients with asthma and other conditions of hypersensitiveness. There are also special classes for children with diabetes, chronic intestinal indigestion, and nephritis. The Neurologic Out-Patient Clinic, an integral part of the Medical Service, has facilities for caring for a wide variety of diseases among which is included the handling of difficult habit problems and questions of mental hygiene.

The Chiefs of the Pediatric, the Ear, Nose and Throat, and the Surgical and Orthopedic divisions of the Hospital and many of their associates hold academic positions in the respective departments of the Harvard Medical School. Likewise the Professors of Pathology, Physiology, Biochemistry, and Bacteriology of the Harvard Medical School are active members of the staff of the hospitals.

The Departmental Staff at the Children's Hospital consists of twenty members with the rank of Instructors or above, five Assistants and five Research Fellows. Nine members of the department are on the Harvard full-time plan, while the remaining members with the exception of the Fellows are engaged in the active practice of pediatrics in the community. The Resident Staff is composed of a

*The motors for these machines are placed in the penthouse on the roof thus excluding the disturbing noises when they are in use.

senior resident, who is the Director of the Medical Out-Patient Department, three assistant residents, and seven house officers. A house-officership is for a term of twenty-one months, new appointments being made at three-month intervals. Physicians who have had at least a year's interneship in a general hospital or in a special department of medicine are given preference. The first three months of the house-officership are spent on the children's ward and the next three months on the otolaryngologic service. During the latter period arrangements are made whereby the house officer is able to secure instruction in the approach to neurologic problems, as well as an acquaintance with normal infants. The next nine months are spent on the infants' and children's wards. Following this, as Senior House Officer, the house officer is assigned for three months to the Out-Patient Department attending the special clinics, and caring for the newborn infants at the Boston Lying-In Hospital. The last three months of the service are spent in the Isolation Unit.

The children's division of the Massachusetts General Hospital as mentioned previously, is an integral part of the Pediatric Department of the Harvard Medical School and is on much the same basis as is the Children's Hospital. The Chief of this department holds professorial rank, five members have the rank of Instructor, four members are Assistants, and there is one Research Fellow. Two members of the Staff are on the Harvard full-time plan and the other members are in practice. There is one resident and three house officers. The physical equipment of this department has recently been modernized, and it is well fitted out as a teaching unit. It consists of two wards divided into cubicles with a total bed capacity of forty-five children. There is a large Out-Patient Department with twelve examining rooms and a daily attendance of about forty patients. There is also an adequate research laboratory particularly equipped for investigation in metabolism and chemistry. An average of twenty-five children at the Eye and Ear Infirmary are under the medical supervision of this department. Approximately one-third of the students in each fourth-year section are assigned to the Massachusetts General Hospital for their clinical clerkships in pediatrics. Here also are offered opportunities for the training of house officers and graduate physicians who are desirous of limiting their practice to children.

The Harvard School of Public Health, directly adjacent to the Children's Hospital, is available to the undergraduate students of the Medical School as well as graduate students for experience in the study and teaching of child hygiene. Conversely, the students of the School of Public Health utilize the wards of the Children's and Infants' Hospitals for the same purpose. Furthermore ample opportunity is afforded the students of the Medical School to obtain experience in Child Hygiene and Preventive Pediatric Clinics by an arrangement with the Commissioner of Health of the city of Boston, whereby Well-Baby and Pre-school Clinics of the city are under the direction of the Professors of Pediatrics of Boston University, Tufts College, and Harvard University. The Harvard Medical School has nine welfare clinics under its direction, one of which is conducted at the Children's Hospital and another at Blossom Street, closely adjacent to the Massachusetts General Hospital.

The Department of Pediatrics renders assistance to the obstetric staff of the Boston Lying-In Hospital by providing medical care for the sick or abnormal infants at that hospital. The care and feeding of the normal newborn infants during their stay at the hospital remains a part of the responsibility of the obstetric staff. This arrangement represents the practical application of principles which both the Pediatric and Obstetrical Departments at the Harvard Medical School believe are sound, and as applied have produced satisfactory results. The house officer on the Pediatric Service at the Boston Lying-In Hospital is assigned from the resident staff of the Children's Hospital for three months and is responsible to the attending pediatricians who are also members of the Pediatric Department at the Harvard Medical School. Infants are transferred to the Pediatric Service from

the nurseries by the obstetricians as soon as problems requiring special care are observed. Otherwise, the infants remain on the obstetric service until discharge, at which time they receive a thorough physical examination by visiting pediatricians. At the time of this discharge examination, an attempt is made to impress upon the mothers the importance of supervision and preventive care, and they are referred to their personal physicians or to a Well-Baby Clinic. When needing further medical care, they are referred to the Children's Hospital.

As regards undergraduate teaching, the required courses are presented in the spring of the second year, throughout the third year, and during one month of clinical clerkship in the fourth year. Lectures are given at the end of the second year to familiarize the student with the study of children's diseases before he comes into contact with patients. In this series are discussed the physiology of nutrition and the principles of infant feeding, the anatomic and physiologic differences between children and adults, a consideration of the normal growth and development of children, and the physiology and pathology of extracellular body fluids.

Sixteen whole class exercises are given during the first half of the third year, in which the more important aspects of the diseases of childhood are presented. Five of these whole class lectures, dealing with special subjects, are assigned to Pediatrics by the Department of Internal Medicine and five whole class lectures in preventable diseases are conducted in collaboration with the Department of Preventive Medicine. The third-year class is divided into groups, and each section, during its assignment to the Children's Hospital for thirty-two days, receives correlated instruction in pediatrics, surgery, orthopedic surgery, etc. The students are assigned to medical instructors for eleven periods (three hours each), where they are brought into intimate contact with patients in the Out-Patient Department. Conference hours are held for each section in which certain aspects of pediatrics are illustrated by didactic talks, by demonstration, and by quizzes on assigned reading. Five clinics are held at which the students present cases for discussion before the entire section. Five afternoon exercises during each section period are devoted to the study of communicable diseases. Two clinics of two hours are offered to the students in each section at the Haynes Memorial Hospital for Contagious Diseases, where there are 150 beds and the instructors hold academic positions in the Department of Pediatrics.

The fourth-year work consists of instruction at the Children's Hospital and the Infants' Hospital or at the Children's Department of the Massachusetts General Hospital. Students act as clinical clerks and attend regular round table discussions, special clinics and the clinico-pathological conference. One afternoon a week is spent in a Child Hygiene Station for instruction in infant feeding and preventive pediatrics, and two ward walks each month are given at the Haynes Memorial Hospital for Contagious Diseases. During their obstetric service, fourth-year students are given instruction in the diseases peculiar to the newborn infant, at the Boston Lying-In Hospital.

A limited number of graduate physicians register each year and special arrangements are made with the Harvard Medical School (courses for graduates) so as to afford them an opportunity for study both in the general field of pediatrics and in special clinical and research fields.

Critical Review

GROWTH AND DEVELOPMENT

The Vitamins and Growth

C. Anderson Aldrich, M.D.
Winnetka, Ill.

PERHAPS no aspect of the growth problem is so much discussed in the literature as that relating to the effect of vitamins on growth. Certainly an astonishing array of facts has been unearthed by investigators in the scant two decades since the name "vitamin" burst upon the incredulous ears of clinicians. At first they derided the idea that infinitesimal amounts of unknown substances could determine growth, life, or death. When the facts were forced into their consciousness, they responded gingerly to the implications, carefully feeling out each new concept with justifiable skepticism. And now that vitamins are well established as entities capable of producing or preventing profound histologic and anatomic lesions in human beings, now that they are known to be deciding factors in many clinical conditions, we see a growing tendency toward the assumption that many abnormalities of unknown etiology may be due to deficiency of these substances. Many men seem to have reached the stage at which they will believe almost anything about vitamins. It is apparent that we are merely entering the gates of knowledge about accessory food factors; our eyes must be wide open, but our steps should be taken cautiously. This is an attempt to summarize what is known of the effects of vitamins on growth only. Other aspects of the subject will be omitted.

In a previous review in this Journal on "The Nature of Growth," it was pointed out that the general growth process could be illustrated by a curve representing the life span of plants and animals. To place the vitamins properly in their relation to this growth curve is fundamental to this discussion. It was shown that the growth process is a complicated one in which factors of general stimulation and inhibition, youth, senescence, and differentiation of tissues, play leading rôles and in which unexplained cycles of growth occur in all animals and plants with remarkable similarity. It seems probable, because of the extremely minute quantities utilized, that the vitamins affect general growth as catalysts of the chemical process rather than by furnishing the basic molecules or building stones of tissues. This would explain the stimulating action of vitamins on tissue cultures and tumors and the fact that, while deficiency prevents growth, administration of overdoses does not produce abnormal size. It seems likely that the statural possibilities of plants and animals are not dependent upon quantities of vitamins in excess of those necessary to catalyze the reaction thoroughly. We must bear this in mind in considering the

statements of those who hold that additional vitamin intake increases growth. Such claims can be true only to a limited extent and then only if a deficiency existed before treatment or in the controls.

An even more complicated aspect of the problem lies in the selective action of the various vitamins on the growth of specific tissues in the body. These various effects are demonstrable histologically as in the keratinization of epithelial structure in vitamin A deficiency, and degeneration of nerves in vitamin B_1 deficiency. This fact necessitates a consideration of two phases with each vitamin, general and specific growth changes.

Another aspect, the interrelationship of vitamins and hormones deserves passing mention at least. This subject is interesting a small number of investigators and undoubtedly will furnish some of the most fascinating reading during the next decade. It is so little understood at the present time that it can merely be touched upon here.

The bibliography here given is in no way complete. It is merely a list of some of the sources of information.

VITAMIN A

It is only recently that a clear-cut conception of the function of vitamin A has been possible. This is because it was confused for a long time with other fat soluble factors and because the ability of the animal body to synthesize it from carotin made many of the early experiments hard to evaluate. At the present time, however, much definite evidence as to its function is available. The following table summarizes what has been demonstrated up to this time.

Effects of Vitamin A Deficiency

1. Absolute Deficiency (in experimental animals only)
   - No growth.
   - Death as quickly as if the animal were starved completely.
2. Partial Deficiency.
   - General growth is retarded.
   - Keratinization of epithelial structures takes place leading to:
     a. Xerophthalmia and hemeralopia (night blindness).
     b. Infectious processes due to abnormal epithelium in upper respiratory tract, lungs, glandular structures of all kinds, genitourinary tract (predisposing to lithiasis).
     c. Sterility consequent upon epithelial changes in sex glands.

While it has been amply demonstrated that in experimental animals vitamin A is an absolute necessity for growth as well as life itself, it should be added immediately that in human beings an absolute deficiency rarely if ever exists due to its widespread distribution in ordinary foods and the fact that it apparently can be formed in the body from at least one component of natural foods. Partial deficiency is possible and leads to pathologic conditions which have been demonstrated in man. Moreover, animal experiments have shown that the need for vitamin A is to a certain extent quantitative since, after control periods on absolutely deficient diets, growth can be induced by its administration in amounts roughly proportional to the amount of the vitamin given. The mechanism of the growth-promoting factor's

potency is unknown, and while it is probably catalytic, it is conceivable that it may carry some fraction necessary for the synthesis of living protoplasm.

It has been shown experimentally that the growth of tissue cultures is stimulated by vitamin A.

Evidence is presented by some authors that overdoses may decrease the life span of experimental animals.

Tyson and Smith give the following résumé of the changes found in rats: "The principal changes associated . . . are metaplasia of cuboidal or columnar epithelium in certain parts of the body, epithelial hyperplasia in various structures in this order: sublingual glands, submaxillary glands, epithelium of the renal pelvis and of the trachea and bronchi. The tongue is regularly involved before xerophthalmia appears. The serous type of sublingual gland is the first to be affected. The lesion in the tongue and submaxillary gland begins with a dilatation of the ducts and a metaplasia of the lining epithelium accompanied by infection. The submaxillary gland is not involved as often as the tongue. The epithelium of the renal pelvis may be involved fairly early. Metaplasia and infection are always present in advanced cases. Renal calculi are prone to occur when obstruction to the urinary outflow is present; pyonephrosis develops which is sometimes followed by perinephritic abscess. Epithelial metaplasia of the trachea and bronchi is not common. The most common observation is an atrophy of the lining cells. Epithelial hyperplasia is striking in the tongue and renal pelvis. In the latter the hyperplasia overshadows the keratinizing process. Infection is always present even in the earliest cases and in the later ones dominates the picture. No metaplastic activity has been seen without infection, but infection has been observed in parts where metaplasia is absent. If the results of the dietary deficiency are not too severe, xerophthalmia clears rapidly with the administration of cod liver oil and the weight curve rises abruptly. The extent of healing in the various organs depends largely upon the amount of destruction due to infection present. Following the administration of cod liver oil, abnormal epithelium and chronic or acute infection persist in the tongue and renal pelvis when the rat is apparently healthy."

It now seems established that the specific pathologic lesion resulting from vitamin A deficiency is this keratinization, not infection. However, as a result of these specific changes leading to decreased and obstructed secretions, all of the regions involved may easily become infected. The fact that experimental animals on low vitamin A rations nearly always showed gross infections clouded the issue for some time. This led to the conception that the vitamin itself was anti-infectious in nature, whereas the preponderance of evidence today points strongly to the idea that the infections observed are due to the histologic changes in structure as a result of avitaminosis, and not to any immunologic function.

It is maintained by many that the incidence of "colds" in some individuals is due to partial lack of vitamin A. On the other hand, the work of Hess and others has not shown that the administration of large doses of this factor decreased the incidence of "colds" over that found in controls without the added vitamin. It should be pointed out, however, that the control groups in these experiments have not

been shown to be deficient in vitamin A. In order to decide the question such controls should be used. This work does show, however, that as far as prevention of the ordinary upper respiratory infections is concerned, the diet in good institutions is as adequate as one in which large additional amounts of vitamin A are provided.

Opinions differ as to its affect on the hematopoietic system, some claiming that anemia does not appear in deficient animals, and that in fact, animals with xerophthalmia have increased red cell counts due to the anhydremia present. Others describe anemia and hemosiderosis in deficiency in human beings.

An interesting phase of the vitamin A problem is presented by its relation to sterility. Deficient animals, both male and female, become sterile because of epithelial changes in the reproductive system. In the male, the germinal epithelium becomes keratinized resulting in decreased function from the onset, although some spermatogenesis goes on even after severe structural damage is evident. Their sterility results from decreased production of spermatozoa, but the process is reversible so that after from five to thirteen weeks of administration of vitamin A, the males regain sexual potency. In the female, sterility is apparently due to the impossibility of successful implantation in the pathologic uterine mucosa. This change is likewise reversible. Sterility from vitamin E deficiency, as will be shown later, is an entirely different process and is not usually reversible in the male.

There is considerable evidence to show that mothers during the lactation period require more vitamin A than at any other period. This should attract our attention to their needs at such times.

Mineral oils when given by mouth are able to dissolve vitamin A, and, since they are not assimilable, may detract from the amount of vitamin actually taken into the body. Recent clinical and experimental work seems to confirm this view so that decreased vitamin A absorption must be admitted as a possible result of mineral oil medication. It is possible that abnormal conditions in the intestinal and hepatic systems may also prevent its adequate absorption.

It has become more and more certain lately that vitamin A can be formed in the animal body from carotin, which is now recognized as its precursor. This fact greatly enhances the ability of the body to provide itself with a necessary food factor.

Summary. Strictly speaking we do not know yet how important this vitamin is in causing actual retardation of growth or structural change in children. The problem does not lend itself to easy experimentation. The specific eye changes and various membrane defects have been described and demonstrated to follow diets low in vitamin A and have been cured by vitamin A administration. It seems quite reasonable to think that some of the severe infectious processes in the respiratory and renal tracts of children of the underprivileged classes may have an anatomic basis in vitamin A deficiency. Its administration in adequate amounts in ordinary diets is easy and should be attended to as a matter of routine.

VITAMIN B COMPLEX

While this was the first of the vitamins to be described, its properties and functions are perhaps the least well known. It has already been split up into two definite fractions, B_1 and G (P or B_2), according

to the classification used. Most of those who discuss this subject seem to think that it will be still further subdivided, that from 3 to 7 different vitamins will emerge from the water soluble B complex. For this discussion we will confine ourselves to the two factors already isolated, B_1 and G (P or B_2).

VITAMIN B_1

Vitamin B_1 is called the antineuritic vitamin because polyneuritis is the best known pathologic state caused by its deficiency. The most common disease found in human beings on this basis is beriberi which has been produced repeatedly by dietary restriction and cured by proper intake of foods containing vitamin B_1.

Vitamin B_1 is probably necessary for general growth and life, but the exact reason for this is not clear. Much of the animal evidence from growth experiments is inconclusive because, until the various factors of the B complex are definitely separated, one cannot say that the deleterious results are due to B_1 deficiency alone. In many of the earlier experiments, for instance, both B_1 and G were used, so that it is difficult to tell whether one or both were active in the growth stimulation demonstrated. At the present time most observers feel that both promote general growth.

In one very definite way, however, vitamin B_1 does influence the general growth of laboratory animals. In animals inanition due to poor appetite results when this vitamin is withheld. This fact, at first accepted with considerable skepticism, seems to rest on very secure experimental grounds. Animals who are starving themselves to death on B_1 deficient diets, will immediately begin to eat well when the vitamin is supplied. This effect has been so striking that some workers have claimed that all of the pathologic processes ascribed to deficiency of the vitamin are, in reality, due to the inanition. Thus Kon and Drummond fed qualitatively adequate diets in the amounts eaten by polyneuritic birds on B_1 deficient diets, and found similar pathologic lesions which they attribute to inanition alone. If such work is definitely substantiated, it will greatly simplify the B_1 problem.

The physiology of anorexia due to B_1 deficiency has attracted much interest. It has been ascribed to lack of secretion of intestinal and endocrine glands, to hypomotility of the intestinal tract, to poor utilization of proteins and imperfect carbohydrate metabolism, to disturbed digestion with impaired absorption and assimilation, to low oxygen consumption and to the accumulation of lactic acid in focal areas in the brain. In this brief review one cannot go into all of these theories, none of which is definitely proved, but all of which are suggested by pertinent facts. It is worthy of note that the implication is apparent that deficiency of this factor leads to changes in function which are more evident than changes in structure.

One of the most interesting observations on B_1 function is that of Maurer and Tsai who found that lack of vitamin B disturbed the mental growth of young rats. When such animals were tested in a maze against controls on normal diets, it was found that they were definitely inferior in ability to learn. It is to be hoped that further experiments will clarify this work.

Many have noted changes in the hematopoietic system of animals on deficiency diets, but it is not as yet clear to what extent these are

due to inanition rather than to vitamin deficiency. Perhaps it is of significance that many of the newer liver concentrates are said to be excellent sources of vitamin B.

The *developmental changes* found in vitamin B_1 deficient animals are fairly definite, whether or not one considers them due to specific vitamin deficiency or to inanition. There are myelin degeneration of nerve fibers extending to voluntary muscles, degenerative change in the fibers of Auerbach's plexus, focal lesions in the brain and pons, hypertrophy of the heart and suprarenals, and atrophy of the mucous and muscular layers of the intestines. It is claimed also that rats stunted by deficiency diets show changes in body proportions, small chests and longer legs. Hemorrhages into the osteogenetic tissues seem to be a part of the pathologic picture. This may be an evidence of close relationship with vitamin C.

Consideration of these histologic changes explains why many men emphasize the predominating effect of vitamin B_1 on body function. Accordingly, it is not surprising to find it reported that the basal metabolic rate is low and that asthenia is a constant symptom in this deficiency.

From the standpoint of the pediatrist, a most interesting phase of the problem has been brought out by the investigations of Sure and his collaborators on the requirements for lactation. It is apparent that in experimental animals the B_1 requirements during this period are far in excess of those for normal growth. This is because the vitamin is not excreted quantitatively in the milk. Thus, animals who were fed just enough of the vitamin to keep them in apparent health, were unable to nurse their offspring successfully because signs of vitamin B deficiency developed in the young. Only when the amount in the mother's diet was increased several times, or when it was fed directly to the young, was proper development obtained. This work confirms the opinion of those who believe that this factor should be administered routinely to babies even if they are breast fed.

VITAMIN G (B_2)

The isolation of this second factor in the water soluble B complex has greatly clarified matters and explained many hitherto contradictory results. From the standpoint of general growth it seems likely that the two B vitamins have similar or supplemental effects, although there is a tendency to call G the "growth factor." In their local action on specific tissues, however, their effects are dissimilar.

The pathologic changes in vitamin G deficiency are so subject to debate that no unchallenged statement can be made at this time. Degenerative nerve, skin, and mucous membrane lesions seem to occur in addition to inanition. Hypertrophy of the suprarenals and a papillomatous condition of the cardiac end of the stomach are reported. Cataract seems to result in certain rodents on deficiency diets. Some of the earlier work tended toward the theory that B_1 was appetite potent and G growth promoting, but more recent experiments seem to indicate that both are important in these functions. This seems to be true also of the lactation requirements. The production of dermatitis and alopecia with stomatitis and glossitis in experimental animals seems to be dependent upon deficiency of G alone.

The principal clinical importance of this latter fraction centers about the contention that pellagra is a specific deficiency disease from lack of vitamin G. Since this is not essentially a growth problem, time will not allow a detailed discussion of this controversy. While absolute proof that pellagra is due to deficiency of vitamin G has not been presented according to the more conservative authors, extremely suggestive facts link the two conditions very closely. It is admitted that diets rich in the vitamin are successful in preventing pellagra and that the disease occurs most commonly in patients who are on diets low in this factor. Treatment with the vitamin has been successful in many patients, but has also been disappointing in those of long duration. It has been contended by the proponents of the vitamin theory, that structural changes due to long-continued avitaminosis, cord and nerve degenerations, may be irreversible so that cure is impossible under any management.

In a recent article, Middleton and Steenbock report that in rats and human beings, atrophic tongue is found in vitamin G deficiency. This condition is of interest because it is found in pernicious, achylorhydric, and pregnancy anemias as well as in pellagra, sprue, and other conditions which seem to be of a dietary nature. These authors were able to produce and cure this condition at will in experimental animals, and observations on five clinical patients brought them to the conclusion that the smoothness of the tongue was a deficiency change.

Day, Langston and O'Brien have reported the regular production of cataracts in the eyes of young albino rats on diets deficient in vitamin G. This seems to be a definite developmental lesion.

Summary—B_1 and G. The water soluble vitamin B complex has been divided into two definite fractions, heat labile B_1, and heat stable G (B_2). It is likely that these will be further subdivided with advancing knowledge.

Vitamin B_1 is of importance in promoting general growth which cannot proceed indefinitely without it; in the proper function of nervous tissue both central and peripheral, and in the development of appetite. It is definitely established that beriberi is caused by its lack.

Vitamin G is a necessary component for adequate growth and for normal appetite, and its deficiency causes atrophic skin lesions, stomatitis and glossitis, cataract in rodents and changes in nerves. It is highly probable that pellagra is in some way connected with low vitamin G intake.

In the case of both fractions lesions have been demonstrated to occur in human beings as well as in animals when they were on deficiency diets, a fact which makes it evident that vitamin B will have to be considered in our clinical work, both with children and with their mothers.

VITAMIN C

Because scurvy, the best known clinical syndrome which results from vitamin C deficiency, has been known for many years to be due to lack of fresh food, it is surprising that this vitamin was not the first to be isolated. The tardiness in its recognition, however, has been largely compensated for by recent discoveries.

General growth and life are absolutely dependent upon an adequate supply of vitamin C. In addition, its deficiency leads to specific local

changes as in the case of vitamins A and B. Experimental animals begin to lose weight in a week to ten days after being put on absolute deficiency diets and usually die in from three to four weeks. Human beings who develop scurvy run a somewhat longer course of illness, but this is probably due to the fact that their diets are not absolutely deficient. The exact cause of the loss of weight and death is not known, but the train of pathologic lesions produced is hardly compatible with life.

Pathology of Vitamin C Deficiency. The gross lesions found in scurvy include edema and serous effusions, hemorrhages into the skin, parenchymatous organs, bones, and particularly subperiosteal hemorrhages, cardiac hypertrophy, enlargement of the shafts of the bones most marked at the metaphysis, fractures, epiphyseal separation, and beading of the ribs.

Microscopically there are found diffuse hemorrhagic tendencies, pathologic changes in bone, and degeneration of nerves. The region where the shaft joins the cartilage is marked by a serrated line. The normal formation of cartilage columns is interfered with. The "white line" seen in roentgenograms at the cartilage junction is called the Truemmerfeld zone and is composed of bone trabeculae, detritus, hemorrhagic material, bone and connective tissue cells. The marrow is loosely organized with bone trabeculae, and few cells are found in the jelly-like substance. Many hemorrhagic areas are found and the spongy bone is soft. This zone is the result of normal bone resorption unaccompanied by sufficient regeneration due to lack of osteoblasts.

When subperiosteal hemorrhage strips the periosteum from the bone, the osteoblasts on the inner side lay down calcium in this area giving rise to the typical appearance in x-ray pictures.

The change which seems to be at the root of all lesions in vitamin C deficiency is probably located in the capillaries, in which there is a failure to lay down cement substance between the endothelial cells. This leads to hemorrhage and to functional abnormalities. Defective teeth probably result from the fact that the odontoblasts seem to change into active osteoblasts resulting in failure to lay down normal dentin and in replacement of this by bone.

In addition to these, degenerative changes in peripheral nerves and in the larger anterior horn cells have been noted. This observation calls to attention the work of those authors who claim to have produced in vitamin C deficient animals, either beriberi or scurvy according to their control of other factors than vitamins. This makes it seem possible, as was mentioned before, that there may be a definite relationship between water soluble vitamins B_1 and C.

As a consequence of the realization that capillary damage is a part of the pathologic picture in vitamin C deficiency, much has been written about capillary resistance tests in the establishment of the diagnosis of milder grades of deficiency than outright scurvy. These tests are made by applying a tourniquet to the arm and measuring the resistance necessary to rupture the capillaries. However, it is probable, according to A. F. Hess, that individual variations in capillary resistance are so great that the tests will be of no practical significance.

Many authors stress the importance of the relationship of vitamin C deficiency and infectious processes as these are practically always present in scurvy. It has been held that decreased resistance to infec-

tions is purely a local tissue effect, and Hess quotes, in confirmation of this idea, cases of nasal diphtheria occurring in patients with negative Schick tests. It has also been held by Minot and his coworkers that bacterial infection may precipitate scurvy in patients who have previously shown no symptoms.

In the last year great advances have been made in the chemical identification of vitamin C. It has been found that hexuronic acid, derived from the suprarenal cortex of cattle, has a marked antiscorbutic effect, comparable to that of a pure vitamin. It has also been claimed that the suprarenal cortex has an antiscorbutic effect roughly proportionate to its content of hexuronic acid. This, again, gives ground for speculation as to the interrelations between vitamins and hormones.

Others have been interested in the possible relationship between vitamin C and narcotine. More recent appraisal of these two attempts at identification seem to favor the hexuronic acid theory over that of narcotine.

Summary—Vitamin C. While we know less of the pathogenesis of vitamin C deficiency than we do of that of vitamin A, it is definitely necessary for growth. Local effects are probably secondary to capillary injury, and this is probably tied up in some way with inability to deposit cement substance in teeth and tissues as well as in the capillaries. The outstanding effects of deficiency, aside from failure to grow, are scurvy, improper development with specific changes in the bones and teeth, tendency to hemorrhage, tendency toward infections, and degeneration of nerves.

It is too early to evaluate correctly the relative importance of the various vitamins and mineral salts in the prevention or cure of dental caries. While experimental proof that vitamin C is a factor in normal tooth development is quite convincing, the demonstration of other food substances which enter into this complicated picture and the existence of improper development on apparently adequate diets, make it seem most likely that vitamin C is only one of the many elements necessary.

VITAMIN D

Because it was closely associated in nature with vitamin A, it was not for many years that fat soluble vitamin D emerged from obscurity. In the two or three years following Mellanby's demonstration, McCollum, Huldshinsky, Hess, Steenbock and many others have contributed so much to our knowledge that today this vitamin is better understood than any of the others in many ways.

Vitamin D stimulates growth in man, experimental animals, and tissue cultures. In its absence, growth may proceed for a time, apparently until available stores have been drained, but then stops so that its indispensability for growth seems definitely established. Relatively little is found in the recent literature on this subject, however, because of the tremendous interest aroused by its specific effect in the prevention and cure of rickets.

It is now recognized that vitamin D results when ergosterol is acted upon by ultraviolet rays, either from the sun or from electrical sources. Recent work attempting to produce vitamin D from ergosterol by other methods is as yet inconclusive.

Pathology of Vitamin D Deficiency. Grossly we find in vitamin D deficiency that there are various bony deformities all dependent upon deficient calcification. Soft, flexible, fragile bony structure results. There is swelling and cupping of the epiphyses.

Histologically the greatest change is found in the epiphyses because it is here that calcification normally takes place. And, as one would expect, this change is most marked in bones which are growing rapidly. The layer of cartilage is much thicker than normal and is soft and pale bluish white in color. At the juncture of the cartilage and shaft a jagged line is seen. Some of the red bone marrow is replaced by gray fibrous tissue. Abnormal formation of the osteoid tissue within the cartilage takes place, but calcification does not follow. Great irregularity of cartilage growth is found because, apparently, of a lack of osteoclasts.

Many interesting facts as to the pathogenesis of rickets are known or surmised, but the exact method by which vitamin D acts is not clearly understood. It was known for years that the calcium and phosphorus metabolism was abnormal in rickets. It was known long before the discovery of vitamin D that children with rickets stored much less calcium and phosphorus than did normal individuals and that cod liver oil increased this retention. We now know that normal children store more of these minerals if any vitamin D source is provided them. This is also true of the mineral retention of experimental animals. Therefore, one of the simplest functions known is its ability to make the body hold calcium and phosphorus in adequate amounts.

Just how this process is brought about is a complicated problem to solve. Three possibilities arise: (1) that it is due to increased absorption from the gastrointestinal tract; (2) that it is due to decreased excretion from the body, kidneys and intestines; and (3) that it is due to increased deposition in bones. It is highly probable that vitamin D does increase the absorption from the gastrointestinal tract because children who are receiving the vitamin have much less calcium and phosphorus in their stools than do those with rickets, whereas more of the minerals are excreted by the kidneys. This is not absolute proof because the decreased amounts in the stools could be due to diminished intestinal excretion.

Not only is it probable that this vitamin increases the absorption of calcium and phosphorus, but it is recognized that it tends to increase their level in the blood stream. With massive overdosage it may even increase their percentages far above what is considered normal. It has been repeatedly demonstrated that adequate administration of vitamin D to normal and rachitic children elevates the blood calcium and phosphorus values above the levels obtained with adequate feeding of these minerals without the vitamin, and this increase is maintained in spite of increased urinary excretion. These facts make it seem that the vitamin acts directly in aiding the blood to retain its minerals.

Apparently these functions, absorption and retention, must be maintained in order to deliver to the bones the necessary salts for bone construction. Very definite relationships are shown to exist between percentages of calcium and phosphorus in the blood on the one hand, and mineral content of and pathologic changes in bone on the other.

It seems possible that vitamin D may aid in the deposition of calcium and phosphorus in bones after raising their level in the blood.

Studies on hypervitaminosis have shed some interesting light on the subject of vitamin D function. According to Harris and Innes, when massive doses are given with diets adequate in calcium and phosphorus, the vitamin increases absorption and blood content to such a degree that the kidneys cannot keep pace with the excretory demand, resulting in the deposition of minerals in any tissues which can receive them. When, however, hypervitaminosis is maintained on diets deficient in minerals, the force tending to elevate the percentages in the blood takes calcium and phosphorus away from bony structures which are actually depleted in such animals. This would make it appear that its specific effect on the blood is the most important function of vitamin D, and that its curative effect on bones is incidental or subsequent to the maintenance of normal mineral content in the circulation.

Another effect of hypervitaminosis is decreased growth and death, due to so-called vitamin D intoxication. It must be remembered that this is as likely to be a calcium or phosphorus intoxication as a vitamin effect. Some observers deny that it occurs when the overdosages are given with calcium poor diets.

When the last word is written about the function of vitamin D in growth and development, it will probably be found that an explanation of its relationship to parathyroid function will furnish a key to the enigma. This hormone is also closely related to blood calcium maintenance.

The ability of vitamin D to elevate the blood calcium values is important in its curative and preventive use in infantile tetany, which disease is always associated with low percentages, but this is not a definite growth problem.

Because of its influence on bone growth it is not surprising to find that many authors have developed the theme that vitamin D is of value in producing and maintaining normal tooth structure as well as in the prevention and cure of dental caries. Evaluation of this contention must await more evidence as in the case of vitamin C, but it is reasonable to assume that there is some basis for the claims.

Summary. We may say the vitamin D is necessary for general body growth and that it exerts a specific effect on the calcium and phosphorus metabolism, probably increasing the absorption of these minerals from the gastrointestinal tract, raising their percentages in the blood, and possibly decreasing their elimination from the body. The result of this mobilization of minerals is to promote normal bone growth. These processes may be associated in some way with parathyroid function. From a strictly growth standpoint, this vitamin is necessary for proper development of bones and teeth. It tends to prevent rickets, tetany, and probably dental anomalies. It is necessary for general growth.

VITAMIN E

Although it is only a few years since the presence of this vitamin was even suspected, very definite information as to its function has been provided. However, its exact importance to general growth is not clearly defined. Growing animals reared on vitamin E deficiency diets

develop normally for a while but later show decreased growth and generally poor physical condition as shown by the condition of their coats, by their behavior, and by their body weights. It has been suggested that young animals can grow without vitamin E but that mature animals cannot exist normally in its absence. On the other hand, the possibility presents itself that the young have stored enough vitamin during intrauterine existence and lactation periods to carry them through to adult life, when, with stores depleted, the deficiency becomes apparent. In any event, this vitamin does not appear to have as immediate and potent effects on general growth as do the others.

Vitamin E was discovered through its specific effect in producing sterility, not through any results on general growth. When it was found that a sterility could be produced in rats and mice which was not due to deficiency of any of the known vitamins, and that the dietary essential necessary to prevent this was needed only in minute amounts, it became apparent that a new vitamin must be evoked to explain the phenomenon.

Early in the study of this food factor an interesting observation was made, that the sterility produced by this deficiency was of an entirely different nature in male and female animals. In the male it was found that there was degeneration of the germinal epithelium, while in the female there were no changes in the ovaries but absorption of embryos took place. Female sterility seems a fetal rather than a maternal function.

When animals are reared on deficiency diets, male sterility occurs later in life than does female, but once the male becomes sterile, fertility can be reestablished in only an occasional instance. This is because the changes in the germinal epithelium are irreversible and is in sharp contrast to the sterility found in vitamin A deficiency where the keratinizing changes are usually curable if resulting infection has not been too destructive. It has been demonstrated that sterility in the male can be predicted by finding immotile spermatozoa in fresh ejaculate. It is also known that more vitamin E is needed by the male to prevent sterility than by the female to prevent fetal death, which seems to indicate that "the seminiferous epithelium in proportion to its mass has higher requirements for vitamin E than embryos in gestation, a fact difficult to correlate merely with the rate of cell division or protoplasmic growth which is certainly greater in the embryos."

Even with testicular epithelium completely degenerated, sterile males lose none of their secondary sex characteristics and show normal sex activity, just as do other cryptorchid animals. This fact supports the contention that the male sex hormone is not secreted by the germinal epithelium.

Sterility in the female seems to have nothing to do with the function of the germ cells as they show no demonstrable injury and ovulation proceeds unimpaired. Apparently sterility is due to the fact that embryos deprived of vitamin E cannot survive and are resorbed after death. It has been shown that the early stages of gestation, up to the time of the implantation of the blastodermic vesicle, proceed normally without this vitamin, and that if a single large dose is given the mother at this time, pregnancy will go on undisturbed. This work not

only indicates that the embryo is primarily involved in the deficiency, but also that the vitamin is stored for long periods of time in the bodies of the mothers.

Only one fact has come to my attention which indicates in any way that the female reproductive system is adversely affected by vitamin E deficiency. Evans states that when pseudopregnancies are provoked in animals on deficient diets by copulation with vasectomized males, spontaneous, nodular deciduomas are formed. Their significance is not explained.

Evans contrasts vitamin E sterility with that due to lack of water soluble B which he thinks results from lack of production of the gonad stimulating hormone of the hypophysis.

In addition to the decreased growth and the sterility produced, the same author has described a nervous impairment with paralysis in a high percentage of suckling young, born of mothers who were on diets just adequate to complete gestation. This condition is preventable if vitamin E is added to the mothers' diets during lactation, proving that this factor is secreted by the mammary glands.

Vitamin E has been shown to increase the growth of tissue cultures. Overdosage has not produced increase in reproductive capacity.

Summary—Vitamin E. The need for vitamin E in the reproduction of small rodents has been thoroughly demonstrated. Subsequent work has shown that it is probably necessary in poultry, rabbits, and cattle although this is not so clearly proved. Some writers claim results with vitamin E therapy in human sterility due to habitual abortion, but no undoubted case is reported to my knowledge. It may be that some species are able to synthesize this factor just as the rat does vitamin C.

RÉSUMÉ

In the past few moments, historically considered, physicians, biochemists and nutritionists have demonstrated that a group of at least six and probably more accessory food factors exists, most of which are absolute essentials for growth, even for life itself. In every instance these factors have been shown to have specific growth effects on localized tissues in various parts of the body as well as more general growth-stimulating qualities. Moreover as a result of these demonstrations, a group of human diseases, hitherto of unexplained origin, have emerged as proved deficiency diseases, xerophthalmia, hemeralopia, beriberi, pellagra, rickets, and scurvy. It has been shown that these newly recognized food factors have extremely complex metabolic effects involving general growth, development and function of specific tissues, and in some instances at least, intimate relationships with the hormones.

The very suddenness with which all this new knowledge has burst upon us makes its sensible utilization extremely difficult. What attitude are we to take toward the vitamin vendors, toward the biochemists, the skepties and the mothers of our patients?

It seems to me that we can all agree to be ultraconservative toward the vendors. They must demonstrate not only potency in the vitamin variations of the "bottled sunshine" theme, but also a probable need for their products in our patients. In this country, need for vitamins C and D among the general child population has certainly been ade-

quately demonstrated, and most pediatrists attend to their administration as a matter of course.

Whereas in Scandinavian countries vitamin A deficiency has been widespread, it has not reached such proportions here as to prove definitely that there is a general need for this factor in the average child's diet above that provided routinely in ordinary food. Recent work in some of our clinics, however, is suggestive that there may be milder degrees of vitamin A deficiency than have been recognized in the past, and it is possible that with refinements in our ability to recognize these, it will be found that partial vitamin A deficiency actually exists in a fairly large number of children.

The prenatal diets of the mothers in underprivileged classes are, in many instances, so grossly deficient in this vitamin that it would not be surprising to find their offspring lacking in it. It is conceivable that this might explain in part their high neonatal mortality from respiratory disease. I have recently been engaged in a survey of such maternal diets, and am impressed by the fact that these mothers expect to grow good babies on diets which are grossly inadequate, pediatrically speaking. The fact that mothers can extract enough vitamin A for their own needs out of diets which are composed mainly of white bread and coffee is remarkable. To think that they can also pass on enough for normal development to the baby, either through the placenta or breast milk, is to expect even more of good fortune. Since we know that the children in underprivileged families die of respiratory diseases in large numbers while those in better circumstances exhibit a remarkable resistance to the same maladies, it may be worth studying the possible vitamin A factor in this circumstance. It seems reasonable that until we know more about this situation we advise pregnant women to pay attention to their intake of foods which contain vitamin A or its precursor, carotin.

Opinion is divided in the case of the vitamin B complex, some claiming that mild forms of deficiency are of everyday occurrence, and others ignoring the situation completely. While actual beriberi is rare in the United States, pellagra is on the increase, a fact demanding our attention. And whether or not it is proved that pellagra is a simple vitamin deficiency disease, it is established that administration of vitamin B prevents it.

The variety of functional disorders, mental and physical, which are ascribed to vitamin B deficiency makes the problem a baffling one to evaluate. However, since vitamin B is now easily administered either in foods or by use of more refined products, and since overdosage is unlikely, it is probably sound dietetics to pay some attention to its supply to infants whether breast or bottle fed. What has just been said need not imply that concentrates must be used. Vitamins from natural sources are probably adequate if actually eaten.

The need for vitamin E has not been demonstrated in human beings, and more evidence must be presented before any reasonable opinion can be expressed.

What shall be our attitude toward the biochemists and their work? I have a feeling that it should be one of unstinted admiration. The best of them have probably made mistakes in technic and interpretation, but these have been entirely unavoidable in opening up a new

field of research. In going over their experiments one is impressed by their meticulous care and control and by the vision of many of the investigators. In the best laboratories the results are comparable to the quantitative experiments of chemists and physicists.

It seems to me that the sweeping statements so often heard to the effect that "all this vitamin talk is useless because normal diets contain them all in adequate amounts" should be firmly refuted. In the first place, who will define a normal diet? And if such a definition is made, who will contend that all children eat it? Did the high starch, rickets-producing diet we fed to infants twenty years ago contain adequate amounts of all the vitamins? If not, what may we think twenty years hence of what we now consider adequate foods? If we respect the nutrition work of today, it is incumbent upon us to prescribe, if possible at the present time, such diets as will contain the accessory factors which will be discovered in the next few years. We can surmise, I think, that the ultimate diet will be a widely diversified one, consisting of foods little changed by processing and cooking. In planning for such dietary regimes for children, many other factors such as appetite education and general hygiene must be taken into consideration. The great lesson to be learned from the biochemists' work is the apparent need in human beings for many different types of food in their natural state. What we need most to learn from them in the future is quantitative information as to dosage.

To the mothers of our patients, who quite naturally are extremely interested in this subject, we must carefully explain what we do and do not know. It is not their fault if vitamins have become a popular subject on every tongue, and we are often their only source of reliable information. If they are skeptical we may stimulate their interest in the necessary factors; if they are overenthusiastic we can prevent bizarre fads and possible harm by overdosage of concentrates.

It seems to me that a word of caution must be sounded at this time against careless forcing of the accessory factors, either in their natural state or as concentrates. We can easily make the same mistake in this regard that was made not so many years ago with calories. The technic of administration must be supervised to prevent psychologic aversion. Even as pleasant a vitamin vehicle as orange juice can be urged and forced so unduly that it meets with violent resistance on the part of the child. In the ideal arrangement as I see it, foods rich in all known accessory factors and probably containing unknown elements of value, should be offered to all children. Feeding of substances which do not contain vitamins should be minimized, and concentrates should be used with care. Even if it were possible to supply in a pill or syrup all the necessary factors, it would be preferable to adjust the diet so that the needed factors could be presented in the proportions naturally provided for. Until such an ideal dietary regime can be made universally applicable to children and pregnant women, it will probably be necessary to use various preparations highly potent in vitamins.

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American Academy of Pediatrics

Proceedings

ANNUAL MEETING OF THE EXECUTIVE BOARD

The meeting of the Executive Board of the American Academy of Pediatrics was called to order at 10 A.M. in the Georgian Hotel, Evanston, Ill., on Saturday, December 2, 1933. Dr. John Ruhräh, President, presided. The following were present:

Doctors:

Thomas B. Cooley, Vice-President
Louis C. Schroeder
Edward C. Mitchell
Henry F. Helmholz
Frederick F. Tisdall
Clifford G. Grulee, Secretary-Treasurer.

The Secretary reported the death of Dr. Harrold A. Bachmann of Chicago.

He stated that he had made one trip since the June meeting and that to the Region IV meeting at Los Angeles, on November tenth and eleventh, and had attended the meeting of Region III and the Central States Pediatric Society at Chicago in September.

He reported that of the special committees, the Committee on Medical Education had been quite active in promoting the Board of Pediatrics which now consists of the following members from the American Academy of Pediatrics: Dr. Borden S. Veeder, St. Louis, Dr. Harold C. Stuart, Boston, Dr. Alfred A. Walker, Birmingham.

The Committee on Nursing Education proposes to get out a questionnaire, and the Committee on Hospitals and Dispensaries is reviewing the work of its survey of children's hospitals and proposes to get out further questionnaires on general hospitals.

The Secretary reported that the JOURNAL OF PEDIATRICS was everywhere favorably received and very little criticism had been heard. That the general state of the Society was excellent, Regional and State Committees were active and nearly all of them were engaged in welfare programs.

TREASURER'S REPORT

Statement of Receipts and Disbursements
May 1, 1933, to October 31, 1933

BALANCE, May 1, 1933		$ 2,904.90
Transferred from Savings Account July 3, 1933		2,000.00
RECEIPTS		
Initiation fees	$1,770.00	
Dues	5,805.15	
Exhibits	510.00	
Interest—government bonds	150.00	
Interest bank account	.99	8,236.14
Total Receipts		$13,141.04

DISBURSEMENTS

Salaries	$3,210.00	
Subscriptions to Journal	2,855.00	
Annual meeting	1,024.65	
Postage	100.00	
Insurance	62.50	
Printing	50.71	
Mimeographing	17.83	
Office supplies	14.73	
Telephone and telegrams	12.32	
Exchange on checks	1.95	
Tax on checks	1.16	
Miscellaneous		
"Festschrift"	200.00	
Committee on Medical Education	19.50	
Committee on Hosp. & Dispensaries	18.55	
Printing—Region III	13.60	
Ill. State Committee	5.71	7,608.21
BALANCE, October 31, 1933		$ 5,532.83

TOTAL CASH

Balance	$ 5,532.83
U. S. Government Bonds	10,382.95
Savings Account	3,370.81
	$19,286.59

The Treasurer reports that there are 45 delinquents from previous years and 203 members who have not paid their dues for 1933-1934 as of November 1, 1933. It was noted that the amounts allocated to regions and states should not be carried over from year to year because of the amount of bookkeeping necessary.

Regarding the annual meeting of the Academy which is to be held on June 11 and 12, 1934, it was voted that this should be held at the Wade Park Manor Hotel and the Cleveland Medical Library, that there should be four sessions, Monday morning and afternoon, Tuesday morning and afternoon, that the sessions Monday morning and Tuesday afternoon should be devoted to eight round table discussions, each subject to be repeated with a different group. That Monday afternoon should be devoted to the general program including the presidential address, address by an invited guest and the business meeting. That Tuesday morning be devoted to two panel discussions on the subjects of: 1. Caries of the Teeth—headed by Dr. Frederick F. Tisdall. 2. Some phase of endocrinology. (The chief not yet determined.)

(For those who are not familiar with the term, "panel discussion," it should be explained that it is really a glorified round table discussion. A table is placed on the platform around which are situated from eight to ten discussors with microphones, each one taking his part in the discussion. Those in the main part of the hall are allowed to enter in by sending up written questions.)

It was decided to have exhibits again this year and to include certain scientific exhibits.

It was decided to concur in the following resolution proposed by the Philadelphia Pediatric Society:

WHEREAS, therapeutics in diseases of infants and children constitutes an important and much neglected phase of pediatric practice, and

WHEREAS, those remedial agents prescribed by the profession, official in the United States Pharmacopeia and National Formulary (5th edition) are employed extensively in treating disease in infants and children, and

WHEREAS, the acceptance of newer drugs and the deletion of remedies at present official in the Pharmacopeia and National Formulary concern pediatricians as well as the general practitioner who treats infants and children, and

WHEREAS, there is a strong tendency to undermine official remedies, including those of pediatric importance and therapeutic usefulness by proprietary remedies through clever advertising, exploitation and salesmanship, be it

Resolved, That the Philadelphia Pediatric Society take the initiative in urging the American Academy of Pediatrics and the American Medical Association through its proper channels to suggest to the officers of The Pharmacopeial Convention of 1930, and to the officers of The National Formulary Convention of 1930, the appointment of a representative group of pediatricians who will fulfill the function in advising and suggesting those remedial agents to be deleted, retained and new ones added to both National Formulary and Pharmacopeia and who will cooperate with all present committees of the Pharmacopeia and National Formulary in furthering the work now undergoing revision. Be it further

Resolved, That the suggestion of average doses for the periods of infancy, preschool and school ages be included in both texts, as has been carried out previously with pharmacopeial and national formulary remedies in adults, and that application be filed with the Committee of Credentials of The Pharmacopeial Convention for a permanent place as delegates to the Convention for 1940.

The resignation of Dr. Robert G. Sharp was reviewed, and it was decided that he should be reinstated upon the remission of his back dues.

Dr. Frank H. Lamb was transferred from Region III to Region IV.

Dr. Henry F. Helmholz, reporting for the Committee on Medical Education, reported that the Board of Pediatrics had adopted a Constitution and were working on the By-Laws. They were encountering difficulties, but expected to have them cleared up soon.

In view of changed conditions, the President has appointed the following two committees to replace the former ones:

COMMITTEE ON PHILANTHROPIC AGENCIES, WELFARE WORKERS, PUBLIC HEALTH AGENCIES, ETC.

Dr. Martha M. Eliot, Chairman, New Haven, Conn.
Dr. Stanley H. Nichols, Asbury Park, N. J.
Dr. Philip F. Barbour, Louisville, Ky.
Dr. W. L. Crawford, Rockford, Ill.
Dr. Oscar Reiss, Los Angeles, Calif.

COMMITTEE ON SCHOOL HEALTH AND SCHOOL HEALTH EDUCATION:

Dr. LeRoy A. Wilkes, Chairman, Trenton, N. J.
Dr. A. Clement Silverman, Syracuse, N. Y.
Dr. M. Hines Roberts, Atlanta, Ga.
Dr. Rockwell M. Kempton, Saginaw, Mich.
Dr. Clifford D. Sweet, Oakland, Calif.

At the suggestion of one of the members of the Academy, it was decided to present to the Society a recommendation for official action, the following amendment to the Constitution:

"ARTICLE VI. Section 2. Any fellow of the Academy in good standing, who because of retirement from active practice, or other sufficient reason, requests such action, may by vote of the Executive Board be transferred to Emeritus membership.

Emeritus members shall have the privileges of active members, with the exception of voting and of holding office. They shall pay no dues."

The following Resolution was passed by the Executive Board on petition of the Regional Committee of Region I:

"To unanimously support in every way the efforts initiated at the Child Health Recovery Conference, held in Washington, October 6, 1933, looking toward the location of undernourished children and development of plans to overcome existing malnutrition."

The following were elected to membership:

REGION I

Dr. H. S. Altman, 1695 Grand Avenue, New York City
Dr. Edward D. Atlee, 1930 Chestnut St., Philadelphia
Dr. Philip S. Barba, 222 Harvey St., Philadelphia
Dr. Paul P. Bender, 3318 Germantown Ave., Philadelphia
Dr. Charles J. Cole, Elkins Park, Pennsylvania
Dr. William H. Crawford, 90 S. Upper Darby Pennsylvania
Dr. Vincent T. Curtin, 316 Connell Bldg., Scranton, Pennsylvania
Dr. Banice Feinberg, 101 Waterman St., Providence, Rhode Island
Dr. Abe S. Finkelstein, 174 Johnson Avenue, Newark, New Jersey
Dr. Charles Frank Fisher, 756 Eastern Pkwy., Brooklyn, New York
Dr. Samuel S. Glick, 3914 Park Heights Ave., Baltimore
Dr. Samuel Goldberg, 4546 Broad Street, Philadelphia
Dr. Harriet L. Hartley, 1601 Walnut St., Philadelphia
Dr. Charles L. Joslin, 422-25 Medical Arts Bldg., Baltimore
Dr. Samuel Karelitz, 1097 Park Avenue, New York City
Dr. B. S. Kelly, 1954 Hudson Blvd., Jersey City, New Jersey
Dr. Peritz M. Kurzweil, 224 E. 12th St., New York City
Dr. Samuel I. Lebeau, 3401 Fifth Avenue, Pittsburgh
Dr. Pascal F. Lucchesi, 1838 Broad St., Philadelphia
Dr. Martin M. Maliner, 164 Arlington Avenue, Brooklyn, New York
Dr. Charles W. Martin, 1502 Mott Avenue, Far Rockaway, L. I., N. Y.
Dr. Edith Alice Mittell, 144-89, 38th Ave., Flushing, New York
Dr. Henry Harris Perlman, 1904 N. Franklin St., Philadelphia
Dr. Maurice L. Ripps, 331 Elmore Avenue, Elizabeth, New Jersey
Dr. James Melvin Sturtevant, 116 E. 63rd St., New York City

REGION II

Dr. Charles H. Dickens, Madison, Georgia
Dr. Henry Hill Harrison, Castanea Building, Asheville, N. C.
Dr. Harry J. Jacobson, 1193 Madison Avenue, Memphis, Tennessee

REGION III

Dr. Stuart Welsh Adler, 420 Safety Bldg., Rock Island, Illinois
Dr. Roy N. Andrews, Mankato Clinic, Mankato, Minnesota
Dr. Ray C. Armstrong, Champaign, Illinois
Dr. Elizabeth B. Ball, 710 West Monroe, Springfield, Illinois
Dr. Earl Hayes Baxter, 327 E. State Street, Columbus, Ohio
Dr. John F. Carey, Woodruff Clinic, Joliet, Illinois
Dr. Isadore R. Cohn, 316 Michigan St., Toledo, Ohio
Dr. Robert E. Cumming, 400 E. 79th Street, Chicago
Dr. Townsend H. Dickinson, 770 Fidelity Bldg., Dayton, Ohio
Dr. Henry W. Gante, 417 Citizens Bank Bldg., Anderson, Indiana

Dr. Samuel J. Hoffman, 185 N. Wabash Avenue, Chicago
Dr. Clyde Carroll Jones, Griesheim Bldg., Bloomington, Illinois
Dr. Kenneth Thomson Knode, 1607 E. Wayne St., South Bend, Indiana
Dr. Harold D. Lynch, 216 S. E. Riverside Drive, Evansville, Indiana
Dr. Lyman T. Meiks, Riley Hospital, Indianapolis, Indiana
Dr. Howard B. Mettel, 614 Hume Mansur Bldg., Indianapolis, Indiana
Dr. E. C. Padfield, 729 United Life Bldg., Salina, Kansas
Dr. C. Clarkson Payne, 1112 Third National Bldg., Dayton, Ohio
Dr. Erling S. Platou, 953 Medical Arts Bldg., Minneapolis
Dr. Byron K. Rust, 723 Hume Mansur Bldg., Indianapolis, Indiana
Dr. Chester A. Stewart, 227 W. 52nd Street, Minneapolis
Dr. Walter Merrill Whitaker, 700 W. C. U. Bldg., Quincy, Illinois

REGION IV

Dr. Crawford Bost, 490 Post Street, San Francisco, California
Dr. Helen Brenton Pryor, 490 Post Street, San Francisco, California
Dr. Roland P. Seitz, 490 Post Street, San Francisco, California
Dr. Roy N. Taylor, 1900 E. Ocean Blvd., Long Beach, California
Dr. Ernst Wolff, 450 Sutter Street, San Francisco, California
Dr. Meldrum K. Wylder, 221 W. Central Ave., Albuquerque, New Mexico.

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The resignation of Dr. James Bruce as State Chairman of Kentucky was accepted, and Dr. Philip F. Barbour was appointed in his place.

It was decided to reduce the Regional Committees to five members each.

REPORT OF REGION I.

During the year 35 members have been added to Region I.

The region as a whole is at present very much concerned with the question of the effects of depression on the increase of malnutrition in children. The problem was considered at length at the meeting of the State Chairmen of Region I held October 28, 1933, at the Academy of Medicine in New York.

New Jersey, Pennsylvania and New York are actively engaged in getting members of the Academy in positions where they can render service to child welfare movements of all kinds. Their methods vary somewhat but the end sought is the same in all states.

Reports were read regarding the work that is being done in New Jersey, Connecticut and Vermont.

It was suggested that the Academy support in every way the efforts initiated at the Child Health Recovery Conference held in Washington, October 6, 1933, toward the location of undernourished children and the development of plans to overcome existing malnutrition.

REPORT OF REGION II.

Dr. Mitchell reported that the states of Region II were organizing, that the problems were somewhat different from those encountered in other regions, that much pioneer work had to be done, that committees had been appointed for the entire district which were taking up different phases of the problems and working together with the health departments and obstetricians. That every state in the south had an active pediatric society with the exception of Arkansas and that every one had an active representative working with the Academy. Educational programs were being started in the various states. In Tennessee the plan has been adopted in which the University of Tennessee and Vanderbilt University are sending out teams

fostered by the district medical societies of the state, which usually consist of from five to eight counties. There are usually two meetings; one in the afternoon for the mothers and one at night for the physicians. Several sessions have been held. The attendance has been very good and considerable interest manifested. Other states seem to be interested and talk of adopting this plan, and several states have plans as good if not better, but as these have been mentioned before they will not be considered in this report.

It was decided that Region II should meet next year in San Antonio the day preceding the meeting of the Pediatric Section of the Southern Medical Association. A committee of three, Dr. Wilburt Davison, Dr. H. R. Casparis and Dr. William Weston, was appointed to determine the details. There will be a morning meeting where clinical material will be shown by the local society. The afternoon meeting will consist of six round table conferences with subjects and personnel to be decided by the committee. At night there will be a short business meeting and a talk by some well-known man of the Academy at the joint banquet of the Section on Pediatrics of the Southern Medical Association and the Academy. Region II as a whole appears to be very much interested in the work of the Academy, and there are a number of new applications which cannot be put through at this time but will come in the June list.

REPORT OF REGION III.

The outstanding development in Region III was the combined clinical meeting of Region III of the Academy and the Central States Pediatric Society. At this meeting the Central States Pediatric Society disbanded and left to the members of Region III of the Academy the heritage of many successful years of clinical meetings. On the last day of this meeting it was decided that Region III would carry on these meetings annually as they had been in the past. The opinion was voiced by many members that these meetings should be of a clinical nature. It was decided that the Regional Committee should have these meetings in charge. It was also decided to invite all the members of the Central States Pediatric Society in good standing at the time of the disbandment, to the annual clinical meeting.

Since the last meeting, 21 applications have been acted on by your Regional Committee and they were unanimously approved by the members of Region III.

Reports from the state chairmen showed gratifying activity in most of the states. No attempt will be made to enumerate the work of the various state committees, but instead an analysis of the type of the work being carried on by individual states will be made so as to give an idea of a general state program.

Report of State Chairman

I. Education of Physician: Combined program with state medical society and state public health association and state university extension program. By furthering a program for county medical societies, for health preservation and care of sick in childhood. Importance of a limited program. Doctor Baxter of Illinois put this into operation and has held numerous meetings throughout the state stimulating a great deal of interest on the part of the practitioner for both the well and the sick child and interesting the physician particularly in caring for the health of children. The state has been divided into districts of the State Medical Society. Chairmen are appointed for each district. Five meetings have been held and similar programs will be put on in various places. In Minnesota, the State Chairman is also chairman of the committee appointed by the State Medical Society which acts with the State Public Health Association and the State University Extension. Work of this type has been going on for some time, but it is hoped to change the character of the work that has been presented. In Michigan a one-day state meeting of a clinical nature

has been held. Special pediatric sections of the State Medical Society have been organized in Illinois and Iowa, although it would seem that there is still a question as to whether it is not preferable, as is being done in Minnesota, to have one or two papers on the program of the Medical Section given over to pediatric subjects.

II. Education of the Public: A region-wide effort to supply speakers to public health agencies, parent-teachers associations, etc., by organization of special committees appointed by the state medical society. Iowa State Medical Society maintains such a medical bureau. Doctor Schwartz has been appointed Chairman of Child Health and Protection. Doctor Burhans has been appointed on an Ohio Committee for the State Medical Society for preventive medicine and public health examination.

III. Cooperation with National, State, County and City as well as private agencies in health work: Illinois has appointed such committees, one for governmental departments and a second committee for private or non-governmental organizations. This, I feel, is something that should be encouraged as well as to interest pediatricians themselves in the executive conduct of such societies. Under the head of cooperation with national agencies come the cooperation of our state chairmen with the children's bureau regarding their studies on prevalence of the undernourishment of children. Doctors Carey, Cooley and Collins were appointed by the governor on his commission to study malnutrition in Michigan. In this connection, an effort to control the adequacy of the diet furnished by public and private agencies, particularly the amount of milk given children, would be worthy of our efforts. Doctor Carey has also been elected to the presidency of the Michigan Public Health Association. Under this cooperative effort will come the relationship to Federal compensation under the Federal Emergency Medical Relief Administration. It is difficult at this time to state exactly what the nature of this work is going to be.

IV. Fostering of School Health Programs: Work along this line has been carried out very successfully in Omaha where an advisory committee on school health has been formed in charge of the State Chairman. This Committee is attempting to carry out this plan in other cities in the state.

It is hoped that in this next year a well-rounded program will be under way in all the states of Region III.

REPORT OF REGION IV.

Dr. Grulee reported for Region IV. The meeting at Los Angeles was very enthusiastic, and things are moving pretty well on the Pacific Coast and in the Rocky Mountain Region. The distances are so great that it is extremely difficult to get men to attend meetings. The work, however, has gone along in many of the states and in others is being held back by the small number of pediatricians in those states.

REPORT OF REGION V.

Dr. Tisdall reported that conditions are not changed in Canada, but that the Montreal and Toronto situation would improve if meetings with Region I, such as those held in Region II, III and IV, could be brought about.

It was voted, that as a temporary measure, owing to the existing economic conditions, the initiation fee be reduced to twenty-five dollars for those elected to membership between January 1 and December 31, 1934.

Academy News

AMERICAN ACADEMY OF PEDIATRICS, MEETING OF REGION II

JOHN MARSHALL HOTEL, RICHMOND, VIRGINIA,
NOVEMBER 15, 1933

Dr. E. C. Mitchell of Memphis, Tennessee, Chairman

CHAIRMAN MITCHELL.—Before starting the meeting, I should like to call attention to the fact that we have with us this afternoon the President of the Academy, Dr. John Ruhräh.

DR. JOHN RUHRAH (BALTIMORE).—Mr. Chairman, I do not want to take up any time of the meeting. I want to say what a great pleasure and privilege it is to be here; but I will be like Paul, when he sat at the feet of Gamaliel, I shall listen.

CHAIRMAN MITCHELL.—The first thing to consider this afternoon is the report of the committees appointed last year. I shall ask Dr. Casparis to report on Committee No. 1.

DR. CASPARIS (NASHVILLE).—The Executive Committee, consisting of public health representatives and pediatricians, met and tried to work out a scheme to get over some principles of better care of children through various agencies interested in or actually handling children. We tried to determine what means we might use to get educational propaganda to the people needing it. First, the question arose as to whether we should include pediatrics and obstetrics in a group or whether we should start with a newborn child and carry it to two years of age. The latter group was selected, and we felt that certain important points should be emphasized by this Committee in carrying out its educational plan to the practitioner who has not had the opportunity some of the pediatricians have had. We emphasized the examination of the child after it was born and its subsequent care, correction of physical defects, immunization, etc. Then we tried to work out some method first, of getting to the people to educate them on how to take care of children and, second, how to get physicians who are concerned to do postgraduate work in this field. We felt that postgraduate work should be undertaken as it best suited the state in which it was proposed. Teams could go out from medical schools and other educational centers, and any other form of educational work best suited to the local conditions in a certain state could be adopted. All of this should be done from the layman's standpoint, under careful medical supervision, using the schools, health organizations, the women's clubs, etc. That was, more or less, a schedule of the suggestions recommended by the Committee. The report was published in the JOURNAL OF PEDIATRICS (vol. 2, p. 635, 1933). If there are any questions, I shall be glad to try to answer them.

CHAIRMAN MITCHELL.—The next report will be from the Committee on "What to Do." Dr. Davison, may we hear from you?

DR. DAVISON (DURHAM, N. C.).—Last December the three pediatricians and three health officers met and formulated what we thought were the wisest preventive methods required for children. The report was published later in mimeographed

form and copies were sent to the health officers. I believe it would be helpful to distribute it in mimeographed or printed form to physicians because pediatrics is a subject on which the average doctor is in need of continued instruction. Copies of this report can be obtained. It is brief, can be modified to suit any particular locality, and you will find nothing included in it on which there is any great controversy. We hope the physicians will read it and carry out some of the recommendations.

CHAIRMAN MITCHELL.—Last year we had a joint meeting with the health authorities for the purpose of promoting harmony between the health officers and the practicing physicians in this Region. The meeting was very successful. I am very sorry that, owing to a session of their own, the health authorities are unable to be with us this year. However, I have received numerous communications from the various commissioners of health of the states and large cities in this Region, assuring me they are still eager to cooperate with us and hoping that next year, if possible, we will so arrange our time that we can again meet jointly.

Is there any discussion or any question regarding the two reports just made?

The next order of business should be a discussion of the type of annual meeting for our Region. Region III met in Chicago this year with the Central States Pediatric Society, and a clinical session was held. I am informed that Region III is to have this type of meeting annually, taking the place of the Central States Pediatric Society which was disbanded.

DR. MOORE (DALLAS).—In order to put something concrete before the conference, I move that we have a one-day clinical meeting preceding the two days of the meeting of the Pediatric Section of the Southern Medical Association.

DR. STANLEY.—I second the motion. I think a local committee should prepare the program for a clinical meeting, limiting the papers to ten or fifteen minutes.

DR. D. LESESNE SMITH (SPARTANBURG, S. C.).—In our part of the country, pediatrists ask, "What does the American Academy of Pediatrics mean?" The Academy has not made progress in our part of the country because we have not had anything concrete to offer. I think one way we will get something concrete is by having these clinics, and I believe it will bring interest to our Section of the Southern Medical Association as well as to other men who are interested in pediatrics.

DR. JOHN RUHRÄH.—Do you think it would be well to include a round table discussion? At the last annual meeting of the Academy in Chicago there were ten different conferences, and it was one of the best meetings I ever attended.

DR. WOMACK (JACKSON).—I attended the meeting in Chicago and the round table discussions. I had the privilege of going to only one of them. The regret I had was I could not attend them all. I should like to see the clinical cases presented but it would be well to have a general discussion too.

DR. McILWAYNE (PETERSBURG, VA.).—Has it been decided that the regional meeting will be held at the same time as the meeting of the Southern Medical Association?

The motion carried.

CHAIRMAN MITCHELL.—In Dr. Moore's motion he stated he wished to have a clinical meeting prepared by the local organization. Is there a motion that these meetings shall embrace a clinical session?

DR. McILWAYNE.—I move that motion be amended so as to have a clinical session in the morning, say for two hours, and in the afternoon the round table discussions by outstanding speakers.

DR. SIDBURY (WILMINGTON, N. C.).—I second that motion.
The motion carried.

CHAIRMAN MITCHELL.—There is another question we should take up; that is, do we want a banquet? The Pediatric Section has expressed its willingness to have a joint banquet with us any year we desire; in fact, we shall do that this year.

DR. COOKE (TAMPA).—I move that we have a joint banquet with the Pediatric Section every year.

DR. MOORE.—I second the motion.
The motion carried.

DR. McILWAYNE.—I suggest that invitations to clinical sessions and round table discussions be sent to every member of the Southern Medical Association. If they do not get invitations, they will feel it is a private meeting, and I believe the meeting should be open to every member of the Southern Medical Association.

CHAIRMAN MITCHELL.—I appoint Dr. Casparis, Dr. Davison and Dr. Weston as a Committee to arrange the next annual meeting of Region II.

DR. DAVISON.—I should like to bring up the question of initiation fees and dues in the Academy. In North Carolina, we have twenty-six pediatricians and only three members of the Academy. Some of the others think it is not worth while to join the Academy because of the high fees. If the Academy is going to accomplish the work it ought to among those who practice pediatrics, the fees ought to be low enough to induce everyone to join.

DR. ROBERTS (ATLANTA).—Dr. Davison's suggestion is fine. I am sure that is true in our state of Georgia. We have about forty pediatrists and very few members of the Academy. Many of them feel the dues do not justify them to come in.

DR. WESTON (COLUMBIA).—I also think Dr. Davison is absolutely right. Only three pediatrists out of twenty-odd pediatrists in South Carolina are members of the Academy. Many of those men feel it is not worth while in the present economic condition of the country to join any organization. I think a recommendation should be made from this Region requesting the Executive Board of the Academy to investigate thoroughly and to consider not only the initiation fee but the yearly dues also.

DR. ROYSTER (CHARLOTTESVILLE).—In principle, I agree with all that has been said about the reduction of the initiation fee and yearly dues, but I think it is perhaps a little unwise to be too drastic. I do not know exactly what to suggest as to the initiation fee, I should say $25.00 as a maximum. As to the dues, I do not like the idea of separating a subscription to the Journal from the dues. If we are to make a strong Journal, as we hope it will be, we have to have the unanimous support of the Academy and I hope that the present arrangement will be maintained, so as to combine a subscription to the Journal and the annual dues. I think the suggestion of a reduction in the annual dues is as far as we should go.

DR. DAVISON.—I still feel quite strongly about this initiation fee. I do not believe reducing it to $25.00 will increase the membership of the Academy. I agree that if we cannot get the Journal for the $5.00 membership dues that the dues be $10.00 a year. So the motion would be $10.00 initiation fee and $10.00 a year annual dues, including the Journal.

DR. ROBERTS.—I second the motion.
The motion carried.

CHAIRMAN MITCHELL.—There is one other point to be discussed; that is, formation of associate membership in the Academy.

DR. McILWAYNE.—At the present time only those who have practiced five years are eligible for membership. I make a motion that it be recommended to the Executive Board that a man who has practiced two years be allowed to join as an associate member, provided after five years' practice he possesses the qualifications to become an active member. I want it to be understood my motion refers to those who practice pediatrics exclusively. Any pediatrist who limits his work entirely to pediatrics but who has practiced only two years is not eligible at the present time.

DR. MOORE.—I second the motion.
The motion carried.

DR. MOORE.—A year or two ago, was some provision made for men who practice in small communities who cannot limit their practice to pediatrics?

CHAIRMAN MITCHELL.—At the last meeting, the Executive Board clearly defined what should constitute eligibility for membership. This report was published in the Journal. No associate membership was provided for. As the matter now stands, one cannot become a member until one has limited one's practice to pediatrics for five years.

There is one other difficulty I encounter. Applications are passed by the Regional Board and are forwarded to Dr. Grulee, the Secretary. This list is then sent out to the membership with a request that it be returned as soon as possible with your opinion of the candidate. The response has been anything but prompt and many do not respond at all.

DR. McILWAYNE.—I think the Journal is becoming slightly too technical. The last two or three issues were very technical. The Journal should keep to the middle ground. Recently I have noticed a good many more technical articles. I would rather see it hold the middle ground and have as many practical articles as possible.

DR. CASPARIS.—I should like to ask whether next year there will be a discussion on the position of the Academy and the work attempted in our Region.

CHAIRMAN MITCHELL.—One of the main purposes of the Academy is to exchange views as to what is going on in the Region. I shall ask each chairman to state what is going on in his community.

May I have the report of the various state chairmen present? Is any one here from Alabama?

Arkansas, I would like to report, has been organized. A state chairman has been appointed but he has not yet functioned.

DR. ROBERTS (GEORGIA).—Because of the very small membership in Georgia, we decided to do all our work through the State Pediatric Society. At the meeting of the Pediatric Society in May of this year, various plans were presented and adopted as advocated by the committee. We have a committee on the education of the laity. This committee last year did some very good work. We have worked through parent-teacher's associations almost entirely. About one hundred meetings were held last year. We prepared a pamphlet which we wanted the women to get and the chairman of the meetings, wherever held, presented this matter. We are working also through the Women's Organization of the State Medical Society. In addition, the first of next year, we are beginning twenty-four syndicated articles on the idea Dr. Casparis suggested, maybe a little broader.

First of all, we have an extension course for physicians in which we cooperate with our State Board of Health and the two medical schools in the state. Last year we reached more than two hundred physicians. This past summer the attendance was not quite so good.

The question of a postgraduate course at one of our medical schools has been up for discussion since the first part of the year. We are still undecided as to what to do. We have written to the physicians throughout the state and have not received the number of answers we should like.

One important addition to the education of the pediatrician has been the establishment of an annual pediatric meeting in our state, which we had in Atlanta this year. We had several splendid speakers and we think the meeting accomplished a great deal. In addition to that, the committee has furnished speakers for the meetings throughout the state.

There is functioning also a Committee on Relations with Child Agencies.

This committee furnishes us data as to what the various child agencies are doing, as to what immunization is going on, etc. We hope from the reports of this committee to form some basis for our actions.

The Committee on Infant Mortality has been added to this group. The study on infant mortality has just been started.

DR. COOKE (FLORIDA).—Since the state does not have a medical school, our activities are very few. We have eight Florida members of the Academy and we hope to enroll more. In Jacksonville the Committee tried to outline a program to see how it would work before adopting it to the other sections of the state. The idea was that a minimum health requirement pamphlet should go out with every birth certificate. This pamphlet brought out the necessity for pediatric examination, immunization and dealing with the common infections of childhood. As one section of that program, we proposed the elimination of the City Board of Health's giving prophylactic treatment to people who are able to pay. This was endorsed by the Medical Society and the Parent-Teacher's Association. The Board of Health has agreed, as far as possible, not to immunize children who are able to pay for it. We have a program of education for the Parent-Teacher's Association and a group of mothers whose children are not going to school, and we believe we are selling them the idea of infant and preschool child care instead of waiting for the child to get to school age. We hope to enlarge this activity.

DR. SIDBURY (NORTH CAROLINA).—Our Pediatric Society holds two or three meetings each year which are well attended. We had one at High Point, one at Wrightsville and expect to have one at Durham within the next few weeks. That is the main activity in our state. Every member of our Society is in touch with the Parent-Teacher's Association which is doing a great work in the state.

The undernourished children in Hanover County are very well taken care of by the Parent-Teacher's Association activities. I think eight or ten pediatricians were appointed on a committee to study the undernourished children in North Carolina. That Committee has not functioned to any great extent, but it expects to follow along the line the American Academy has recommended.

DR. WOMACK (MISSISSIPPI).—We have just organized the State Pediatric Society as a result of the efforts of the members of the Academy. We are working not only as Academy members but through every agency that will help. We are using the county unit plan. We have recently organized and have in operation a Maternity Center Society, which takes in the city and the entire county of nearly 100,000 people. The expectant mother must come the first month of pregnancy and is examined by the men who will do the delivery work. She is examined monthly, and when the baby is born, the expense is paid at the local hospital. We stress the educational features, teaching mothers how to take care of themselves, etc.

We have a county health officer, who is very able and works in close harmony with us. We have frequent school examinations, and physical defects are reported to the parents with recommendations as to what is to be done. Lectures are given to high school girls about things they ought to know. You would be surprised to know how interesting that work is.

DR. CASPARIS (TENNESSEE).—We do not have a great many members except in the two or three larger cities. For the last several years, Dr. Mitchell and I, representing the two medical schools in the state, have carried on a great deal of educational work with parent-teacher's associations, mothers' groups and county medical societies. Not only he and I, but also members of our staff in the two medical schools and other members of the Pediatric Society have been called on.

Recently we have had greater official contact with the state health authorities. Dr. Mitchell is a member of the Advisory Council of the State Health Department, and Dr. Owen Wilson, another pediatrician, is also a member.

There has been a good deal of postgraduate work in the two medical schools, and general practitioners may spend four months taking postgraduate work, which gives us an unusual opportunity to stress these ideas. There have been about forty men in the state who have taken the postgraduate course.

Arrangements have been made with the State Medical Association whereby teams of pediatricians can be sent out to the county medical society meetings.

CHAIRMAN MITCHELL.—Just a word in addition to what Dr. Casparis has said. We only go to places where a good attendance is indicated as a result of a joint meeting of several county societies. The parent-teacher's association in particular guarantees a large attendance. At our largest meeting we had one hundred fifty mothers present. At night there were about seventy-five physicians present. The points we dwell on are that we wish to give to the mother information regarding the care of the well child, direct from the staffs of the two universities of the state. We have found that the mothers as a result of reading in the various lay magazines, may have obtained information which is not accurate and perhaps is hazy in their minds. We have also tried to sell them the idea that they should go to their family physician for the regular health examination and discussion of health problems of their children.

In some of these rural communities we have found that the health department is functioning because the physicians either are not capable or will not take the time to care for these problems as they should.

At each of our meetings we hand out a blank sheet of paper to each mother, giving her the opportunity to write questions. This was perhaps the most interesting phase of the meeting. After our meeting with the doctors in several instances, members of the Society have come forward with a request that regular postgraduate instruction of this type should be made available if such could be arranged.

DR. STONE (VIRGINIA).—The Academy has not officially undertaken any specific program in its own name in Virginia. It has been the opinion of the members who have conferred on the matter that more effective work could be done through cooperation with the existing agencies than by attempting to launch an independent program.

The fourteen members of the Academy in the state are all active members of the Virginia Pediatric Society. The latter society has approximately fifty members, though all of these do not limit their work to pediatrics. Through its Child Welfare Committee, this society has been active in its efforts to promote an educational program that will stimulate the interest of the medical profession in child welfare work.

The Bureau of Child Welfare of the State Health Department and the Bureau of Mental Hygiene of the State Department of Public Welfare have done much to arouse public interest in child health. With this education of the lay public, there appears to be in some quarters a need for impressing the physicians with the importance of preventive pediatrics in the matter both of protection against specific diseases and of guarding against the more insidious nutritional disturbances.

It has been the function of the Department of Clinical Education of the Medical Society of Virginia to stimulate and assist in the holding of scientific programs by its component county and group societies. During the past two years it has carried on a very helpful program of obstetric instruction through the services of a full-time field clinician. There has been manifest a desire on the part of the profession for similar instruction in pediatrics. The Child Welfare Committee of the Medical Society of Virginia and of the Virginia Pediatric Society have directed their efforts toward the inauguration of such courses, but have been seriously handicapped by lack of financial support. There is in prospect now a program of pediatric instruction under the auspices of the Department of Clinical Education, utilizing as instructors eighteen members of the Virginia Pediatric Society, including services for lectures and demonstrations. It is hoped that ultimately all sections of the state may be covered and the general profession will be impressed with the importance of this work.

Besides the work done through the Department of Clinical Education, each of the two medical schools in the state, that is, the University of Virginia and the Medical College of Virginia, held yearly postgraduate clinics, and pediatrics is included on each of these programs.

By actively supporting these movements fostered by the state and its component societies, it is believed that the Academy can exert a more potent influence than by sponsoring an independent program.

No report from Kentucky, Louisiana, Oklahoma, Texas, West Virginia.

There being no further business, the meeting was adjourned.

Comments

THE writer had the interesting experience of sitting in at the "Child Health Recovery Conference" which drew fire last month from one of the Journal's correspondents.

While it was of course rather absurd to designate as a "conference" a meeting called for no other purpose than the announcement of a cut and dried program which the Children's Bureau hoped to wish upon the health officials and medical societies of the various states, and while it is quite true that no evidence was adduced of any extensive malnutrition due to the depression, nor any convincing method of estimating malnutrition; nevertheless the attitude of our last month's commentator to the Children's Bureau and its project does not seem entirely fair. Some of us, at least, feel that there is real danger of serious damage to the nutrition of children in families "on relief," even though these effects are not as yet very apparent, and that there is in many areas a very clear need for better medical supervision of the methods of expenditure of relief funds. In the writer's district, for instance, it seems to be perfectly possible for the pater familias to spend on coffee and tobacco the money that should go for milk and the necessary vitamins for the baby, who may be living on almost nothing but cereal. From what one hears, really adequate, well-chosen dietaries for families on relief are the exception rather than the rule. Two classes of children are especially likely to suffer from badly chosen diets, that is, those in the most important growth periods—infancy and adolescence. The fact that we lack accurate methods of estimating these effects, and the further fact that some of them may not become apparent until later on, do not affect the desirability of forestalling them, if possible, by some more reliable means than the broadcast distribution of relief funds. Active participation by medical men, even pediatricians, in child welfare activities is not the rule in most of the states, and if the Children's Bureau sees an opportunity born of the economic depression to stimulate such participation, who can blame them for taking advantage of it?

The unfortunate part of the program, as it is being carried out in some states, is that emphasis is being put in the wrong place. Wholesale examinations of school children for "malnutrition" by weighing and measuring them and pinching their muscles is not a very enlightening procedure. What is needed is the development of more efficient methods of instructing people in the proper use of foods, especially for the baby, who cannot make his needs manifest so easily as the older child. Education of this sort requires skilled guidance from physicians and trained nutritionists. If the Children's Bureau succeeds in its apparent desire to stimulate the formation of state child welfare groups, in whose activities organized medicine shall have an important part, a valuable thing will have been accomplished, which will justify the capitalization of the depression bogy and the collection of a lot of useless statistics.

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